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Vanishing Crop Land
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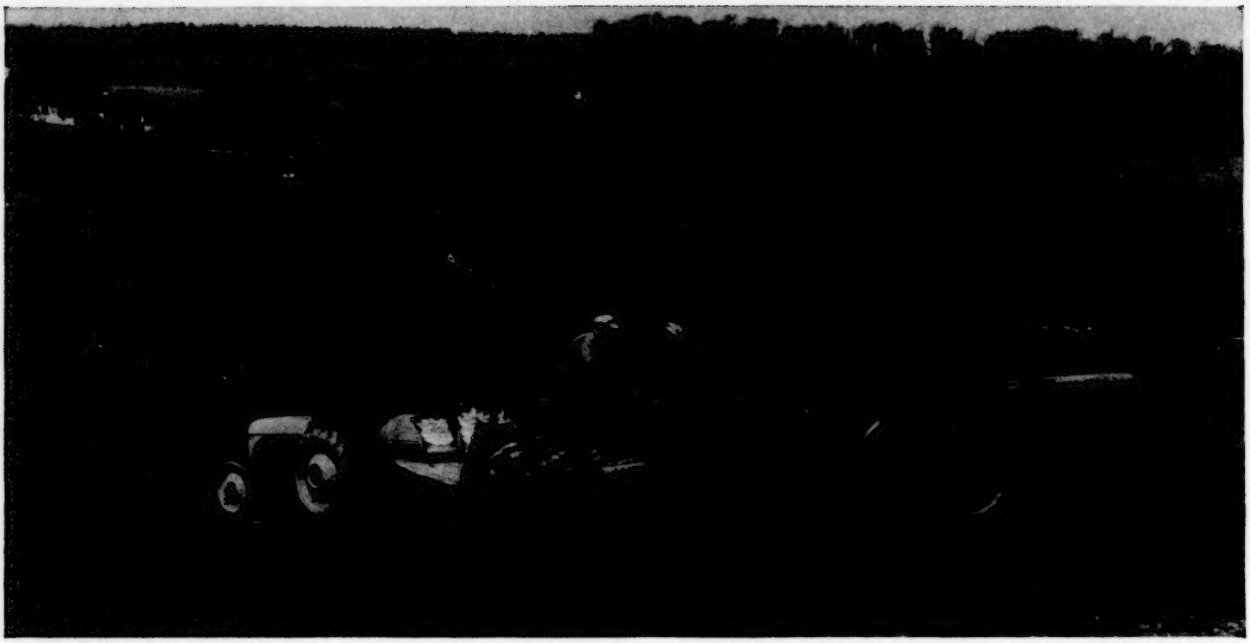
Book Reviews: The Range and Pasture Book; Soil Conservation; Tomorrow's Birthright; Japan—Land and Men; Prosperity Beyond Tomorrow and Others.



Clyde Speck and Willard King load fertilizer in the spreader, for use on Mr. Speck's farm, near Asbury, New Jersey.

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*Evans, H. J. and Purvis, E. R. (Rutgers University) "Molybdenum status of some New Jersey soils in respect to alfalfa production".—Agronomy Journal 43:70-71 (1951).

Experience of Mr. Clyde Speck demonstrates this notable improvement

On his farm near Asbury, New Jersey, Mr. Speck has a field of some 14 acres planted to alfalfa. His yields on successive cuttings decreased, and finally Mr. Speck decided to put the field to other use.

"About this time," said Mr. Speck, "I showed this field to a salesman for a fertilizer company. He examined my soil and told me that other farmers in this area had been having trouble with alfalfa. He suggested that we use Moly on this field of mine, and then re-seed.

"We applied Moly, about 2 to 3 ounces per acre. We had the Moly mixed with my regular fertilizer, and then I re-seeded. For the three years since I applied Moly to this field I have had good stands of alfalfa and the yields are fine. Moly made the difference."

All crops need Moly, as shown by widespread tests in U.S. and abroad

During the last 15 years tests made in many parts of the United States and abroad show conclusively that all crops need Moly in a form that can readily be assimilated. When available Moly is not present in the soil Moly should be added, either alone or combined with fertilizers.

"My alfalfa field now has a full stand," says Mr. Speck, and I feel that with its Moly-deficiency corrected it will continue in high production for several years.

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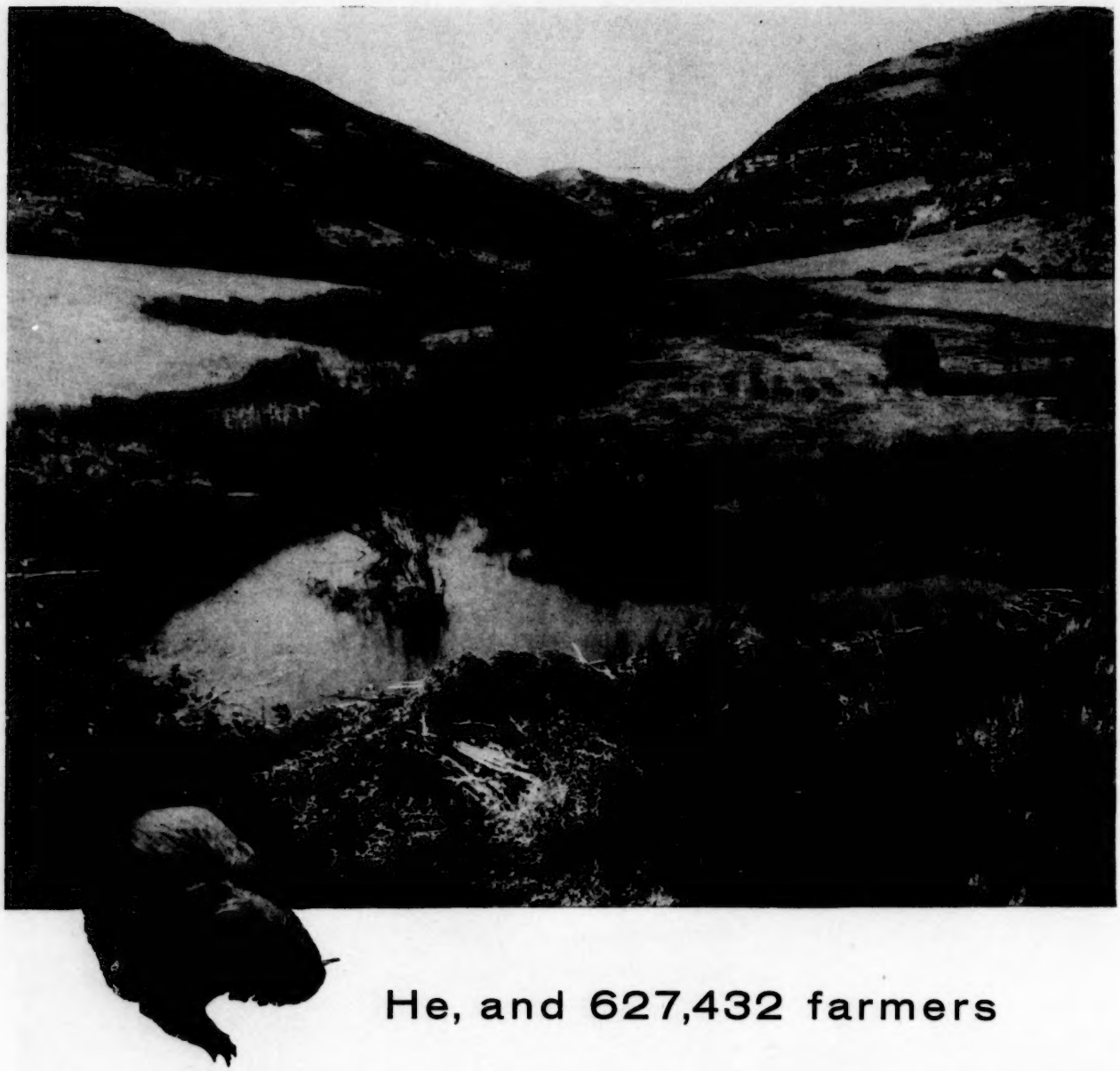

He, and 627,432 farmers

A beaver's only tools are his teeth and his claws. Just to make things tougher, he works mostly at night.

Yet, a pair or two may build an 80-foot dam eight feet high, end up with 20 or so dams in a mile of stream. These dams check silt-laden floodwaters, release clear water gradually during dry seasons. In forested watersheds they can be an important first step in flood control.

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627,432 farmers have ponds they made themselves. And under the capable guidance of Soil Conservation experts everywhere, the work will go on. *Ferguson*, Racine, Wisconsin.

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VOLUME 11
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Cover: FAO's technical mission to Libya covers a wide range of activities. Afforestation is especially important where so much of the land is desert. This scene shows a planting of living grasses to hold the sand. Small trees are planted in the center of each square. Even though many of them may die, those that survive will form the beginning of new forests. Photo Courtesy FAO

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Legumes, storing up nitrogen and producing an abundance of organic matter, are a tonic for all other crops in the rotation, yet they more than pay their way. A season's growth of good alfalfa, for instance, not only produces a profitable crop but will fix from $10 to $20 worth of nitrogen per acre.

Another part of this story is that modern farm equipment is designed to help farmers work this "gold mine in the sky." Ask any John Deere dealer for more information on this equipment.

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Water Yield and Public Land Management

J. M. ROSA AND A. R. CROFT

This country has become vitally concerned with water for every human need. Droughts and short water supply plague many regions. Land management agencies are faced with mounting pressure to make watersheds yield all the water that can be safely produced without unleashing serious floods or erosion. Over the years much has been spent to restore the plant cover to damaged watersheds but some water users are now wondering if some "useless" vegetation isn't being watered from their pot.

PUBLIC LAND MANAGEMENT agencies are faced with mounting pressure to make the areas under their control yield all the water that can be safely produced without unleashing serious floods and erosion or destroying the soil mantle on the water-producing lands. Currently severe droughts and critically short water supply in several regions have forced many people, who are affected by these shortages, to recognize the seriousness of this problem. In an increasing number of instances the immediate result is a demand that public lands be made to produce more water. Often these proposals are made without full consideration of the necessity of maintaining acceptable water quality, protecting water storage facilities against rapid sedimentation, lessening flood damages, or of maintaining the other productive values of forest and range lands.

Uncontrolled use and lack of protection of forest and range lands soon after settlement resulted in serious depletion of vast areas in the West and during the past half century the managers of public lands have endeavored to restore the vegetative cover on badly damaged lands and to protect it against further decline in those places where damage had been less severe. *Some people are now questioning these objectives and the measures used and are advancing arguments that increased vegetation on mountain and foothill lands uses water to which they feel entitled.*

Basically the problem involves two questions: First, how much has water yield been changed as a result of cover changes due to use of watershed lands for grazing; and second, is it possible to increase water yield by managing the plant cover primarily in the interest of water yield with forage and timber as by-products?

These are not academic questions—they are being asked by many downstream water users. Land managers themselves also need answers to guide the programs which they administer. *This paper deals only with the first of the above questions — particularly whether or not there appears to be a relationship between past grazing use and total annual yield of water from some western streams fed mostly by melting snow.*

Five experimental forest and range areas have been established so far by the Forest Service with the study of the second question as one of its principal objectives. Many small watersheds are being gaged and otherwise observed to obtain necessary information on their hydrologic behavior and the causes; some areas are having their cover changed for experimental studies. Years of observation and data gathering are required to measure this sort of change and the passing of time cannot be hastened if reliable and accurate results are to be obtained.

There is, however, a considerable backlog of scientific information and observation which can help move back the clock for the detailed watershed studies. Long records of precipitation and runoff are available which, on analysis, might indicate the behavior of drainage basins under past conditions of use. Although more adequate answers will still depend on a continuation of present and expanded research, some indication of the magnitude of probable changes in streamflow relationships may be obtained by either, (a) comparing the runoff of tributaries within major drainage basins by plotting against elevation or precipitation, as illustrated by the section on the Upper Snake and Upper Colorado Rivers; or (b) comparing early years of runoff records with the recent streamflow adjusted for climatic differences by graphical or statistical methods, as illustrated by later sections dealing with streams in Salt Lake County and the Sevier Lake Basin, Utah.

Annual Runoff and Losses, Upper Snake and Colorado Rivers

As an example of the first method, where runoff of adjacent tributaries was compared, annual runoff by elevation zones was first drawn on maps of the Upper Colorado and Snake River basins. The maps showed the estimated virgin flow of the Upper Colorado River to be 17,000,000 acre-feet and of the Upper Snake and Salmon rivers, 24,000,000 acre-feet. Perennial streamflow, largely from melting snow, comes from those parts of the basin at high elevations, largely in national forests and national parks. These areas produce up to 95

J. M. Rosa is hydrologist and A. R. Croft is forester for the United States Forest Service, Intermountain Region, Ogden, Utah.

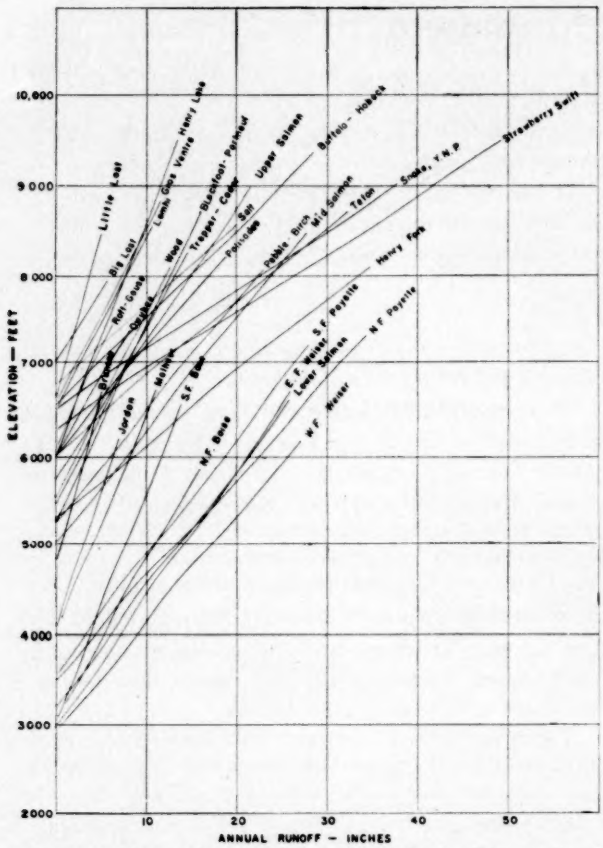


Figure 1. Water yield of tributaries of Snake River related to elevation of the watershed, Idaho and Wyoming.

per cent of the flow from some major tributaries and about 80 per cent of the total water supply as an average for the entire area of the Upper Snake and Upper Colorado rivers. The distribution of average annual runoff with respect to source areas is shown in *Table 1.*

Table 1. Distribution of Average Annual Runoff, Upper Snake and Colorado Rivers.

Upper Snake River[1]			*Upper Colorado River*[2]		
Depth (inches)	*Area (per cent)*	*Percent of total runoff*	*Depth (inches)*	*Area (per cent)*	*Percent of total runoff*
40+	0.3	2.0	40+	0.2	4.0
30+	1.5	8.0	30+	1.5	15.
20+	7.5	33.	20+	3.0	35.
10+	21.	65.	10+	9.5	68.
5+	39.	86.	5+	15.	83.
1+	64.	98.	1+	32.	98.

[1]Based on records from about 250 U. S. Geological Survey Stream gages in Idaho, Wyoming and Nevada, above Clearwater River.

[2]Based on records from about 200 U.S.G.S. and State Engineer stream gages in Colorado, Wyoming and Utah, above Lee's Ferry.

Annual runoff increases with elevation above about 3,000 feet in the western part of the region (Payette-Weiser rivers), Figure 1. This lower limit of significant amounts of average annual runoff becomes progressively higher toward the East, being located about 7,000 feet in the Upper Snake and Upper Colorado rivers. This limit roughly corresponds with the 15-20 inch zone of normal annual precipitation. Therefore, runoff can generally be estimated by subtracting about 17 inches from the annual precipitation in the forested mountains of this region.

There is surprisingly little variation between actual and predicted runoff when water yield is associated with precipitation or elevation. For example, out of the records of 174 gages on tributaries of the Upper Snake River, less than ten per cent depart widely from the computed. All of these departures can be explained by short stream flow records, inadequate numbers of rain gages, underground flow from springs, irrigation diversions, or other influences. Therefore, either the cover conditions are remarkably uniform or else the effects of past differences in cover type and condition on water yield do not appreciably exceed the errors in determining basin-wide precipitation and runoff from limited observations by the Weather Bureau and Geological Survey.

Trend of Annual Runoff from Streams in Utah

Long-time records of runoff from small watersheds with forest or range cover which can be used to study the effects of changing watershed conditions are available for few places in this country. Aside from experimental watersheds, the best data on runoff from mountainous areas in the West have been taken by city water departments. For example, in the Intermountain Region, six small streams draining the Wasatch Mountains near Salt Lake City, Utah, have been gaged for 50 years. These areas cover from 20 to 50 square miles each, ranging in elevation from 5,000 to 11,000 feet and yield from five to 30 inches of runoff annually. Most of the timber was destructively cut years ago; mountain brush now constitutes the main cover, *Table 2.* Parts of these areas have been and remain closed to grazing to protect domestic water supplies for Salt Lake City and its suburbs.

The total snow cover on the six drainages was computed by elevation zones. It was possible to approximate more closely the mean elevation with which the average runoff was associated, by weighting the area in each elevation zone by the precipitation. Only slight adjustments were necessary to check the actual runoff from each drainage within an average error of ± 0.3 inch, *Table 3.* This indicates that changes in cover types and conditions have not appreciably changed the total amount of annual runoff expected at the different elevation zones on each stream compared to the average for all streams in the vicinity.

The relation of annual runoff to precipitation was studied both graphically and statistically for periods of time when watershed use was different from that of today to discover if there was any discernable trend in water yield, Figure 2. It was noted that precipitation of the

Table 2. Condition of Salt Lake County Watersheds, Utah, 1948.[1]

Watershed	Area (Acres)	Cover Types					Plant Density					Erosion		
		Herb	Sage	Browse	Timber	Rock	0-10%	15-25%	30-50%	55-75%	80-100%	Slight	Moderate	Severe
		Acres												
City Creek	10,229	169	2099	6768	944	249	0%	14%	13%	23%	50%	79%	21%	0%
Emigration	12,685	272	3359	9020	0	34	0	2	35	0	63	63	15	22
Parleys (Lambs Canyon)	6,221	218	0	3276	2,727	0	0	0	47	9	44	64	36	
Big Cottonwood	31,454	1497	0	6191	16,006	7760	0	0	29	29	42	100		

[1]Flood Control Survey, Intermountain Forest & Range Experiment Station.

current year accounted for about two-thirds of the annual variation in water yield. Water yield generally increased during the early years and dropped an average of about two inches per year during the drought period of the 1930's with higher temperatures and resulting greater water losses. However, the remaining long time cyclic change after climatic factors are evaluated amounts to so small a percentage that one doubts if there are adequate ways of measuring and testing variables where so few rain gages and snow courses exist. Further study of these and other records may reveal whether these trends are due to short climatic cycles and whether changes in seasonal yield result from the recovery of watersheds following protection.

Table 3. Comparison of Actual and Computed Runoff, Salt Lake County Streams.

Tributary	Area	Annual Runoff	
		Gaged	Estimated
	(sq. mi.)	(inches)	
City Creek	19.2	11.6	11.3
Emigration	17.4	5.2	4.8
Parleys	51.2	6.7	6.8
Mill Creek	21.6	9.3	9.8
Big Cottonwood	50.5	19.4	19.5
Little Cottonwood	28.7	29.1	29.5

A picture of the condition of the Salt Lake County watershed around the turn of the last century and the probable causes thereof is presented by the following quotation:[1]

"The fine summer range on this watershed being easily accessible to the old settlers and to a large part of the population of the state since 1947, it was naturally used to its utmost for grazing with the result that vegetation on the watershed was badly damaged. The struggle for supremacy on the range between cattlemen and sheepmen, and between rival sheepmen, was a strong factor in hastening destruction of the ground cover. In 1900 to 1903 the mountains had been practically shaved clean of all vegetation that stock could eat, the aspen was girdled by gnawing sheep, and much of the evergreen reproduction was killed by trampling and fire. The small owners were forced to abandon the range on account of the marked decline in its carrying power.

. . . "Previous to the inclusion of this land in the Wasatch National Forest, fires were of frequent occurrence. While the greater portion of the timber had been cut and destroyed, these fires did vast damage to the watershed by burning off the brush and vegetation and by killing the reproduction. . . .

"The inevitable result of this treatment, prolonged for over 50 years, was to interfere with the regularity of runoff in all the canyons, which flooded every spring and after each heavy storm on the divide. City Creek did more damage and attracted more notice than any of the others because it is the only one which flows through the city. Channels 75 feet

[1]Reynolds, R.V.R. "The Watershed and Water Supply of Salt Lake City, Utah" U. S. Forest Service, Oct. 1912.

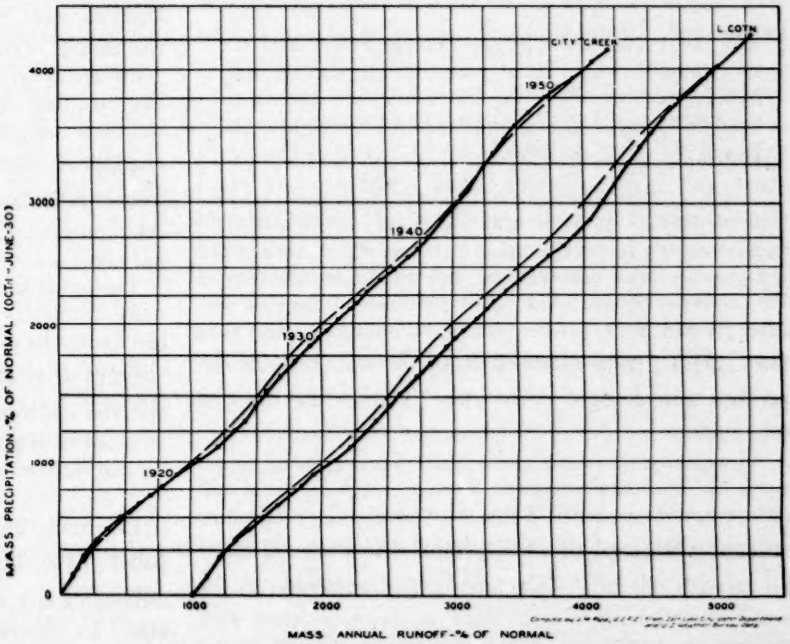
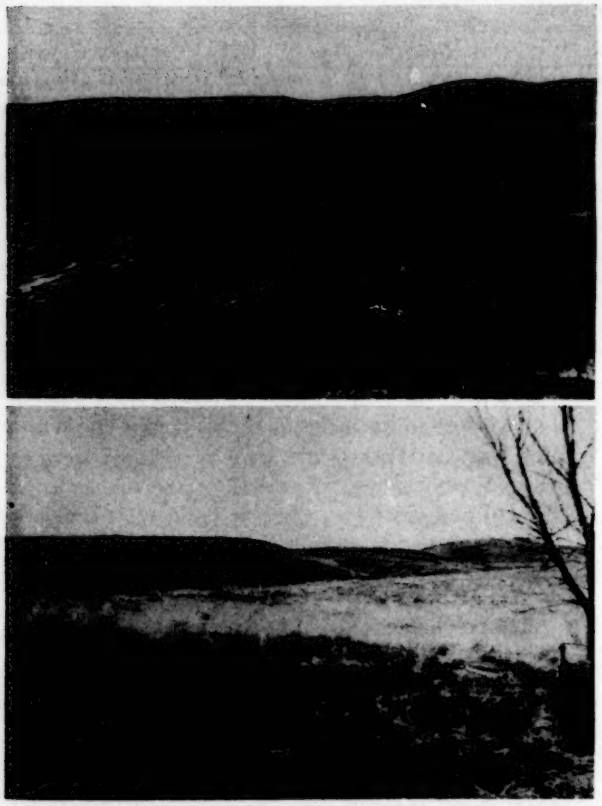


FIGURE 2. Mass curves showing the relation of winter precipitation to annual water yield from City Creek and Little Cottonwood drainages in Salt Lake County, Utah, during the last 50 years.



—*Photos Courtesy U. S. Forest Service.*

Figure 3. Parley's Canyon above Salt Lake City, May, 1909 (*above*) and (*below*) in May, 1949. Dense grass has invaded bare gullied area in foreground.

wide were cut down North Temple Street and the city flooded from State Street to Jordan Bridge. People were drowned, houses torn down, and thousands of tons of gravel and boulders swept into the streets."

A statistical analysis was made of the relation of annual runoff to precipitation for periods of time when grazing use was different on Beaver River and Sevier River above Hatch, Utah. The first period selected was after World War I when livestock numbers were at a peak. This period extended from the war into the depression and drought years when livestock use dropped off rapidly.

A summary of runoff computed from regression equations for normal precipitation (rain and snow from fall to spring) is shown in Table 4. Correlation coefficients indicate that most of the variation has been explained by climatic factors. This table shows examples of the small variation of mean runoff to be associated with changes in grazing use, which may have occurred during the different periods of time.

Little Cottonwood Creek runoff did not drop during the drought period when adjusted to normal precipitation. Beaver River runoff may have dropped one per cent in recent years. The Sevier River stream gage at Hatch shows that the annual runoff in recent years dropped only two per cent. In other words, it may be concluded that possible changes in vegetative cover have not reduced the water supply over one to two per cent or less than 0.2 inch. By coincidence, the damaging summer flood runoff does not exceed those percentages even if entirely prevented by better watershed management.

Table 4. Annual Runoff of Utah Streams Computed from Precipitation.

Regression runoff for normal snow & precipitation	*(per cent)*	*Correlation Coefficient*
Little Cottonwood		
1912—1925	101	0.79
1926—1941	102	0.85
Beaver River		
1920—1934	98	0.83
1935—1947	97	0.92
Sevier at Hatch		
1920—1928	109	0.93
1939—1947	107	0.67

Conclusion

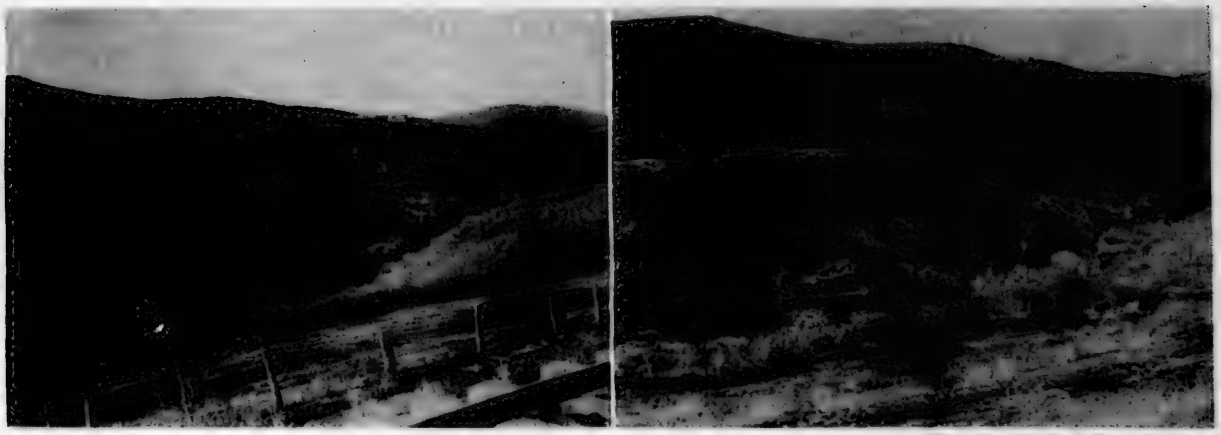
The trend of runoff from certain gauged tributaries in the Intermountain region has been variable. The percentage of precipitation appearing as runoff occurs in short cycles being both above and below average several times during each of the periods studied. No significant change can be established, because the standard errors for the various groups of data used in this analysis were generally higher than any differences of the means. True, several drainages show a slight downward trend in runoff for selected time periods beyond the variation in precipitation, but the short cycles seem to show only a vague resemblance to the long time changes in grazing use. They are more likely to be merely reflections of the inadequacy of existing data or the influence of other climatic factors such as temperature not accounted for in this analysis.

The opposite of the above thoughts could be stated more positively. No long-time actual gauging records are known to exist in this region which clearly show any significant change in total annual streamflow (after climatic factors are recognized) which could be attributed to improved vegetation or past land use changes on the watershed.

Discussion

Livestock numbers on watersheds discussed in this paper have fluctuated considerably since settlement, although exact records for each watershed are not available. In the state of Utah as a whole cattle numbers in thousands have fluctuated as follows[2]: 1870, 100;

[2]Utah estimated number of livestock on farms January 1, 1867-1950. U.S.D.A. B.A.E., Office of Agri. Statistician Salt Lake City, Utah, 5/16/50.



—Photos Courtesy U. S. Forest Service.

Figure 4. *Left:* Parley's Canyon above Salt Lake City, May, 1909 and (*right*) in May, 1949. Little, if any, change in brush density or composition has occurred.

1892, 420; 1902, 332; 1920, 558; 1935, 411; 1945, 585; 1950, 560. Trend in numbers is up at the present time.

Sheep numbers in thousands show the following fluctuations: 1867, 167; 1901, 2,882; 1915, 2,068; 1931, 2,775; 1950, 1,284. Trend in numbers is down at the present time.

On the Salt Lake City watershed grazing use was very heavy in early pioneer times, reaching a maximum about 1900, but since then has been practically eliminated in the interest of protecting the city's water supply.

It is practically impossible to detect any significant relationship between livestock numbers and total annual water yield on the drainages studied. This is made doubly difficult by the fact that changes in precipitation from year to year have caused fluctuations in annual water yield of about 400 per cent from Beaver River and the Sevier River above Hatch, Utah. Even though the flow for the entire year may not have changed, changes in peak or low flows may have occurred. Peak stream discharges from summer rainstorms, for example, may have increased in many areas. Based on studies made of drainages in Utah, streamflow from summer storms is less than one per cent of total annual yield.

Review of pertinent literature on this subject shows that several other investigators have failed to find evidence that changing the density of low vegetation has affected materially the total annual water yield.

The problem of possible changes in streamflow as a result of changing vegetal cover used by livestock may be considered also in light of knowledge gained from research and observation during the past twenty years. To begin with, streamflow is a "residual" of the precipitation—being the amount of water left after interception by the vegetation and capillary water storage in the soil mantle are satisfied. The remainder of the precipitation may then percolate through the soil as free water to streams or to ground water. Obviously, to change the amount of free water that passes through the soil would require changing the amounts of interception by the vegetation and that stored in the soil and used in plant growth.

Let's consider interception first. Thinning of grass and other low vegetation available to livestock would likely decrease interception of summer rains and increase the amount of water reaching the soil. This small amount of water, however, is stored in the soil and lost by evaporation and transpiration. Since low growing species on high mountains are covered with snow most of the winter months, it seems unlikely that either dense or thin vegetal cover would change greatly the amount of snow intercepted.

We know that the amount of water required to "prime" the soil mantle so it will percolate water to streams may be changed by one to two inches on plots by changing grass cover to mixed weeds and vice versa. Since such changes rarely, if ever, occur on more than ten per cent of western watersheds, any effects such a change may have in increasing or decreasing total annual water yield are apparently so diluted by the water yield from the remaining parts of the watershed, that their effects have not been measured by standard stream gauging procedures.

The question of increasing or decreasing total annual water yield by changing vegetal cover, if it can be done, involves also some other basic questions.

For example, it may be argued that a water user has the right to all the water that the watershed produced under the natural conditions existent at the time of his original appropriation. But does he have any legal or moral right to streamflow increase, if any, that must be purchased through loss of: Forage for livestock and

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Molybdenum—Essential to Well-Being of Plants and Animals

FIRMAN E. BEAR

So much interest has recently been aroused in the nutritional value of molybdenum that it seemed desirable to review the available scientific evidence on this element in detail. Accordingly, one complete issue of SOIL SCIENCE (Volume 83, Number 3, March, 1956) was set aside for this purpose. Nine papers were requested from soil, plant, and animal scientists in Australia, New Zealand, England, and the United States. These men had been carefully chosen because of their special knowledge of one or another phase of the subject. Their papers, together with an appended bibliography of 392 references to every known scientific paper on molybdenum in relation to plants and animals, constitute the 100 pages of that issue.

AMONG THE MANY points considered in SOIL SCIENCE were the roles of molybdenum in living things, the amount of the element contained in soils, and the methods for determining the availability of that in soils to the plants growing on them. Relationships of other soil elements to molybdenum absorption and utilization by both plants and animals were reviewed. And symptoms of deficiency in plants and of excess in animals, and the means of bringing such imbalances under control, were fully covered.

Recognition of deficiency symptoms is of first importance in reaching a decision as to whether a given element merits special study in any region in relation to current crop production. As an aid in this connection, an eight-page supplement, with reproductions of 15 color-photographs, was inserted in the issue. These show deficiency symptoms in hibiscus, sugar beet, lettuce, beans, grapefruit, tobacco, cauliflower, broccoli, tomato, cucumber, white and red colver, alfalfa, and wheat.

Necessary for Nitrogen Fixation

It is now known that molybdenum is the one mineral element specifically associated with nitrogen fixation by the nodule bacteria on the roots of legumes. It is equally essential to nitrogen fixation by azotobacter, clostridium, and other non-symbiotic bacteria, fungi, and algae that inhabit the soil. Molybdenum is also required in nitrate-reductase enzyme systems that reduce root-absorbed nitrate to ammonium forms as the first step in the synthesis of proteins. Under conditions of deficiency of molybdenum, nitrate may accumulate in plant tissues to concentrations of 5,000 ppm., or higher, of the dry weight of plant material.

But plants fed on ammonium compounds or urea also need molybdenum, although in much smaller quantities than are required for nitrogen-fixation and nitrate reduction. Its other specific function or functions in plants are somewhat obscure. It is believed to be necessary in the production of ascorbic acid. And it appears to function in iron metabolism.

Other evidence indicates that molybdenum is also essential to animals. Xanthine oxidase, a flavoprotein containing both iron and molybdenum, is a constituent of cow's milk and rat liver. A complex of molybdate and ferrous sulfate has been found to be better than ferrous sulfate alone in the treatment of anemia in humans. And molybdenum is an important balancing agent for copper in animal nutrition.

Five Pounds in Plowed Acre

Soil is the normal source of all the molybdenum contained in plants and, by way of plants, of most of the molybdenum in animals as well. *The total content of the element in soils averages about 2½ ppm., equivalent to five pounds per acre to a 7-inch plow depth.* This quantity, though small, may be entirely adequate in meeting the molybdenum needs of plants. But much depends on its degree of availability and the concentrations of other nutrient substances in the soil solution.

Discovery of widely-distributed areas of deficiency of molybdenum for plants led to attempts to develop means for testing soils for their available supplies of the element. One such method involves growing a standard plant on the soil in question and analyzing it for molybdenum. If the leaves contain 0.5 ppm. or more of the element, on a dry-weight basis, this will generally be an adequate supply. Considerably lower concentrations than this are frequently found in plants growing on molybdenum-deficient soils.

A more rapid and dependable procedure for testing soils calls for extracting them with an ammonium oxalate solution at pH 3.3, developing an orange-colored molybdenum thiocyanate complex from the filtrate, and evaluat-

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ing the color thus produced by the use of a colorimeter. Pastures generally respond to molybdenum treatments when the concentration of the available portion of the element in the soil falls to 0.14 ppm. In general, the response level is believed to be at about 0.20 ppm. at a soil pH value of 5.0, and 0.05 ppm. at pH 6.5. These values vary with the several crops, being generally highest for the legumes and the brassicas. The nodule bacteria of legumes have especially high molybdenum requirements.

Millions of acres of molybdenum-deficient soils have been located in Australia and New Zealand, where much of the earliest work with this element was done. These are generally very old soils, and badly weathered. They are often high in quartz and extremely low in feldspars, notably in their finer fractions. They tend also to be high in iron oxides and to have low exchange capacities. Mention is frequently made of ironstone soils and those derived from graywacke and from remnants of laterites. Young soils, especially those of alluvial, glacial, or volcanic origin, are usually much higher in molybdenum than residual soils.

Acid Soils Most Often Need It

In the United States need for molybdenum appears to be greatest in the acid sandy soils along the Atlantic Coast and the Gulf of Mexico. But deficiencies are also widely known in soils derived from calcareous rocks and minerals and from serpentine. The alkaline solutions developed from such materials during the soil-forming process favor the dissolving of molybdates, with consequent loss in the drainage water. Unleached alkaline soils tend to be high in molybdenum, as do certain peat soils.

Molybdenum deficiency in plants may result from the presence of competitive or antagonistic ions in the soil solution. This appears to be particularly true of sulfate ions, which depress the uptake of molybdate by plants. On the other hand, applications of soluble phosphates tend to increase the availability of soil molybdenum by releasing it from the anion-exchange complex in the soil. The phosphate and sulfate ions in ordinary superphosphate tend to neutralize each others effects, as measured by the molybdenum uptake of plants.

The molybdenum and manganese contents of plants appear to be negatively correlated. Soils that are high in available manganese, whether due to a high total content of the element or to high availability of that present because of low pH values, may require heavier than normal applications of molybdenum. This is termed a "manganese-induced deficiency," being related to the antagonistic relationships between these two elements.

"Yellow spot" is a readily recognized symptom of molybdenum deficiency in citrus that has been known to grove owners for at least 50 years—long before the cause had been determined. Water-soaked spots appear on the leaves and develop into oblong yellow blotches. These areas turn brown as the tissues die. The leaves finally fall off, with resulting loss in fruitfulness of the trees. This disease is general in the citrus groves of Florida and is widely known elsewhere.

Figure 1. Whiptail of cauliflower, the most readily recognized symptoms of molybdenum deficiency. *Photo by E. R. Purvis, New Jersey Agricultural Experiment Station.*

'Whiptail' Best Known Symptom

"Whiptail" of cauliflower is the most striking and most specific symptom of molybdenum deficiency. This disease has been observed in the field in this country and abroad for 30 years, and probably much longer than that. The leaf tissues of deficient plants develop irregularly from the midribs to form long narrow leaves with contorted edges. Heads fail to develop or, if they do, are usually unsalable. Molybdenum is now being applied to control whiptail in Delaware, Florida, Louisiana, Maryland, New Jersey, New York, Ohio, Rhode Island, and West Virginia.

Molybdenum deficiency symptoms in legumes usually show up as yellowing of the leaves, stunted growth, and general lack of thriftiness of the plants. In severe cases

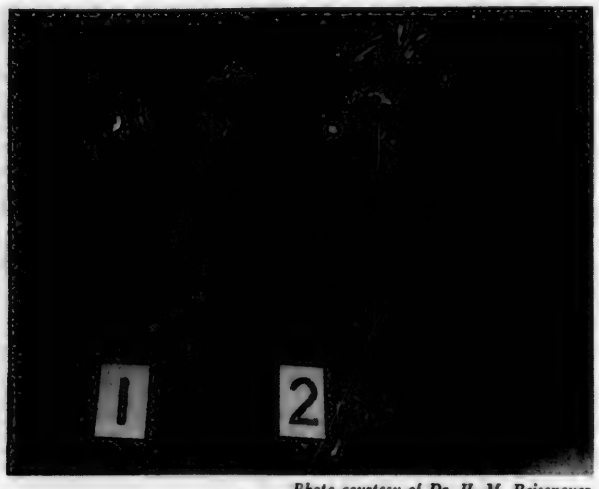

Photo courtesy of Dr. H. M. Reisenauer, Washington State College, Pullman, Washington.

Figure 2. Alfalfa grown on a soil deficient in molybdenum shows a striking response when adequate molybdenum is added to the soil. The plant pictured on the right (2) was grown on a deficient soil to which adequate amounts of molybdenum were added. The stunted plant on the left (1) did not receive molybdenum.

the leaves curl inward and their edges become scorched. Outstanding examples of such symptoms have been found in Australia and New Zealand, where the native white clovers had virtually disappeared from large acreages of pasture land. Irregular spots of dark green legume-grass growth stood out in luxurious contrast to the remainder of the field in spots where trees had been burned. Analyses revealed that the wood ashes contained as much as ten ppm. molybdenum. And from this came the clue as to what was lacking in the soil.

Molybdenum deficiencies in legumes, with corresponding symptoms, have been found under field conditions in New Jersey, South Carolina, Texas, and Washington. There is laboratory evidence indicating possible deficiencies also in Idaho, Maryland, and Wisconsin.

Broccoli, lettuce, spinach, summer squash, tobacco, and tomatoes are other good indicator crops for use in checking on the molybdenum status of soils. These plants show characteristic yellowing, mottling, necrosis, scorching, or leaf-cupping symptoms of deficiency, or a patchy appearance in the field.

Deficiencies of other nutrient elements as well as of molybdenum complicate the symptom patterns. Once these other requirements have been met, the need for molybdenum may be much greater, the symptoms of deficiency more clear cut, and results from supplying the element much more apparent.

Molybdenized Superphosphate Used

In Australia it is now common practice to apply molybdenized superphosphate. This contains 1½ pounds of molybdenum trioxide per long ton (2,240 pounds) of superphosphate, equivalent to about two ounces of molybdic oxide per acre at the usual rate of application of fertilizer to grazing land. By this means phosphorus, sulfur, and molybdenum, all three of which are often in deficiency in grazing lands, are supplied. The carrying capacity of New Zealand sheep pastures is conservatively estimated to be doubled by such treatments. Yield increases of nearly 400 per cent have been recorded.

Legumes respond best to applications of molybdenum under conditions of nitrogen deficiency in the soil. Nitrogen fertilizers are much more likely to increase legume yields when molybdenum is lacking than otherwise. Large pink nodules indicate an adequate supply of molybdenum, and such nodules contain much higher concentrations of the element than the remainder of the plant on which they are growing.

Ounce of Molybdate or Ton of Lime?

Molybdenum deficiencies in acid soils can often be overcome by liming. Availability of the element increases directly with rise in pH value of the soil. But the favored procedure is to apply both lime and molybdenum. Much less lime is thus required. In fact, the evidence indicates that one or two ounces of sodium molybdate can replace the extra ton or two of limestone that might otherwise be required for optimum yields.

With large-seeded plants like beans or peas, use of seed from areas of molybdenum-rich soil have met the requirements for two generations of the crop, but failed thereafter. Whiptail has been controlled by dissolving one ounce of sodium or ammonium molybdate in ten gallons of water and applying this solution to ten square yards of seedbed two weeks before transplanting. Molybdate sprays of similar concentration are being used to control yellow spot in citrus.

The need of alfalfa for molybdenum can be met in solution culture by as little as one ppb. of the element. Toxicity tends to develop in plants at concentrations of ten ppm. of culture solution. Yet plants growing on molybdenum-rich soils have been found to contain over 100 ppm. of the element, on a dry-matter basis, without showing any evidence of injury. Under ordinary field conditions plants adequately supplied with molybdenum normally contain between one and three ppm. of the element.

As far as is known, molybdenum toxicity enters the agricultural picture only in relation to livestock production. Although the element appears to be essential as a respiratory catalyst, trouble may be experienced with cattle at concentrations above ten ppm. dry weight in *green* forage. The disease is variously known as "teart" and "peat scours." The symptoms include severe diarrhea, loss of hair, and emaciation. And unless a correc-

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Land and Water and FAO

JOHN BLACKMORE

The work of FAO, the Food and Agriculture Organization of the United Nations, reaches all around the world into 72 countries. This international program has one ultimate goal: The better use of the world's natural resources to serve mankind's needs for food and other products of agriculture, forestry and fisheries.

THE CONCERN with the development of agricultural resources takes the form of many different kinds of activities, some at headquarters in Rome, and others in remote parts of the world. The work of FAO involves engineers working waist-deep in the cold water of mountain streams in Asia; locust-control experts working on the sandy wastes of the Arabian peninsula; and soil surveyors making bore-holes and preparing maps in the jungles of Brazil. It also requires the work of statisticians at their desks, devoloping designs for experiments on the fertilization of rice; sociologists studying the possibilities of making settled farmers out of migrant populations in the Near East and economists working on problems of marketing of fish and other foods.

The adhesive that makes all these pieces stick together in one program is mankind's growing needs for the improved use of resources. The world's population is growing and there is a tremendous desire for higher levels of human living. These result in an increased demand for the service of the world's natural resources, particularly those useful for providing foods and fibres.

Problems relating to the products of farms, forests and the sea require that attention be given to many aspects of resource use. *The program of FAO may at first seem to be a heterogeneous collection of activities, but when viewed as a resource conservation and development program each of the projects can be seen as converging toward the over-all goal which is better resource use for the benefit of mankind.*

For the most part, FAO is concerned with problems of renewable resources. These are those resources which, if conserved and managed with care, can provide an unending supply of products useful to man. Most soils, water, forests, fish and animal life are renewable and FAO's work centers on the conservation and wise use of such resources.

Over the years, FAO's main goal remains unchanged, but the particular program activities that are carried on are varied to meet the needs of the time and of the particular individual countries.

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The photographs used in this article are through the courtesy of FAO.

Figure 1. The first step in helping Iran to develop its land and water resources was to make a comprehensive land survey of the region. This photograph shows Dr. M. L. Dewan of India and engineers whom he trained, fixing a point on a land survey map.

When the proposal for establishing FAO was first considered at the Hot Springs Conference in 1943, the world was torn by war. The compelling need was for more food. By the time of the actual founding of FAO at Quebec in October, 1945, the war had ended but the need for food was still more urgent. The world faced the spectre of Robert Malthus, the English economist who long ago forecast ultimate poverty for the world's population because it would outrun its food supply. Not only in the war-torn areas of the world, but also in other areas, hunger in 1945 was the daily companion of millions of people.

In its first years, therefore, FAO gave greatest attention to increasing and stabilizing the world's food supply. There is no way to measure the effects of FAO's work on the world's postwar food problems. Its efforts merged in with those of the member countries, with those of the Colombo Plan supported by the people of the British Commonwealth and with the U. S. Point IV Program supported by the American people. The results of these

Figure 2. There are several FAO experts working in Indonesia at the present time. Here is Dr. George Hauser, FAO soils specialist, and members of the staff of the Agricultural Research and Experiment Station conducting a soils profile study.

combined efforts are clear, however. The ancient shadow of Malthus has again retired from view in most of the nations of the world. This is not to say that the world has no food or resource use problems. The continually expanding economies of nations around the world, and steadily growing populations are putting greater pressure on agricultural, forest and fisheries resources. Moreover, there is today a rising interest in many nations to improve their use of these resources, so as to free their people from the bondage of poverty and disease. Such interests are being served by the United Nations and the several specialized agencies, one of which is FAO.

The Organization of FAO

FAO is unlike any agricultural agency at work in the United States. It is something like a cooperative in which the members are 72 nations. Every two years, representatives of the member governments meet in a conference to approve a program and budget for the organization. The conference also appoints the Director-General and empowers him to employ a staff. The present Director-General, Dr. P. V. Cardon, was appointed in 1953. Dr. Cardon is well-known in the United States for his many years in research with the U. S. Department of Agriculture. Because of reasons of health he has recently submitted his resignation.

The staff of FAO is drawn from all the world. It includes citizens of more than 50 countries. There are three official languages, English, French and Spanish. Most publications are released in all three languages.

The technical work of FAO is carried on by five divisions: Agriculture, Forestry, Fisheries, Nutrition and Economics. The Agricultural Division is one of the largest. Its work is divided among five branches: Land and Water Use, Plant Production, Animal Production, Agricultural Institutions and Services, and Rural Welfare.

Another large division deals with problems of economics including statistics. Data are collected from all over the world on agricultural production and distribution. At present plans are being made for a World Census of Agriculture to be taken in 1960.

The Forestry Division's work ranges all the way from reforestation to wood consumption. Problems of the world's supply of pulp-wood have received major attention in recent years. Increasing attention is also being given to problems of watershed protection and to arid zone forestry.

The Fisheries Division's work includes biological, technical and economic activities. A major effort is being made at the present time to encourage the processing and consumption of fish in countries where diets are low in proteins and where resources for the production of fish are available.

The staff of the Nutrition Division works on problems of human food consumption and some aspects of food production technology. Attention has been given to the development of improved data on food requirements and consumption as a basis for aiding countries in the development of food policies. Major work in recent years has been on improving the nutritional levels of diets, particularly in raising protein levels. Technological investigations of fish products, fruit processing and packaging have been undertaken. An active program to improve food quality has been carried on in cooperation with the United Nations Children Fund.

FAO Has Many Tools

The founders of the FAO prescribed two tasks for it: (1) The collection and dissemination of information, and (2) promoting action. Not an action-taking agency itself, FAO serves as a means whereby its member countries can better act on their agricultural resource problems. This characteristic of FAO's work has resulted in the development of a set of program devices not for dealing directly with the world's resource problems, but for aiding governments to deal with them. Three principal devices are used: FAO makes extensive use of reports of many kinds; it sponsors many kinds of conferences and meetings; and it assigns experts to work in particular countries.

The collection and publishing of statistics and other information is not a very spectacular part of FAO's work, but it is a major means for assisting in resource development work. Governments and industry depend on FAO for statistics of many kinds relating to agricul-

ture, forestry, fisheries and international trade. Special reports on technical subjects are also prepared, so as to provide information on world-wide or regional problems. FAO publications such as *Efficient Use of Fertilizers* and *Improving the World's Grasslands* have been read by thousands of people in all parts of the world. Periodicals dealing with agricultural, forest and fisheries matters are issued to member governments and subscribers.

Conferences, Commissions and Committees

These well-known devices are used by the FAO to bring together technicians or officials of the member governments. For example, the European Committee on Agriculture is a permanent body with representatives of more than 20 governments. It has a group of Sub-Committees and Working Parties to deal with many kinds of agricultural problems.

The International Rice Commission is the focal point for programs of research on breeding, fertilization, production and processing of this crop which is of such strategic importance in many parts of the world. Permanent committees are used to sponsor continuing technical programs such as research on pasture and forage in Mediterranean countries, or soil classification and survey work in Europe. Temporary committees of many kinds are also used.

A specialized type of conference sponsored by FAO is the Training Center, which is a technical meeting lasting usually six to ten weeks. There are a combination of classroom instructions, seminars and field inspections. Most often they are directed to some technical problem of a region of the world, and are attended by government officials who can use the knowledge gained in their daily work. Such training centers have dealt with problems such as farm mechanization, extension methods, forest research, fish production, and statistical methods. A series of three such centers have been held on problems of land tenure reform. These meetings in Latin America, the Near East and the Far East have been effective in promoting needed adjustments in land use in these regions.

Technical Assistance is Extensive

Currently, FAO's largest resource development activity is the technical assistance work. Recently, a professor from Mississippi State College was appointed the 1,000th FAO technical assistance expert for service in a member country. Such experts are drawn from many countries and work all over the world assisting the FAO member countries develop the production potential of their basic agricultural resources.

An important part of the technical assistance work is the survey mission which is made up of senior experts sent to a country upon request of its government. The mission and the officials of the government jointly lay

Figure 3. *Top:* This is the site of the salt water barrier on the Kobadak River in East Pakistan. Flood silt is deposited over the fields. Incoming tides also bring silt up from the sea which is often deposited on the land. *Center:* Cotton is an important part of Iran's economy. This photo shows a flume controlling the flow of irrigation waters on the experimental cotton plots used in the research program conducted by FAO. *Bottom:* An FAO expert taking flow readings as the waters die away after one of Wadi Jizan's periodic floods in the province of Tihama, Saudi Arabia. These gullies are usually dry and dusty.

Figure 4. One of the special activities of the International Rice Commission of FAO is the Rice Hybridization Project at Cuttack in Orissa, India. Nine nations are participating in this plan for improving yields of rice.

out a long-range program to be implemented by experts recruited by FAO for service in the country.

The main work of providing technical assistance is carried on by individual experts employed by FAO. Some of these experts work on short assignments of three or four months. Most experts, however, spend a year or more on each assignment.

For the most part these experts operate as teachers providing advice and training for the specialized personnel of the government where they serve. In the view of FAO an expert in two or three years can best contribute to a country's resource development by enlarging the technical knowledge and improving the capabilities of the country's own specialists.

A technical assistance expert who has done a good job leaves the country of his assignment with a going program of work staffed by a competent group of nationals of the country. There is also a new tendency in FAO programs to make more use of training fellowships through which personnel of a country are provided opportunities for study in other countries and thus return to their home work with improved training and wider experience.

FAO's Projects in Land and Water Use

The technical assistance projects at the FAO are, to a considerable extent, directed to the development and better use of basic resources. A great deal of attention is being given to water resource development, primarily for irrigation.

In East Pakistan FAO, in cooperation with the Colombo Plan countries and the ICA, is aiding in the development of the Ganges-Kobadak project. This is a scheme for the pumping of water from the Ganges River to irrigate nearly a million and half acres of rich alluvial land. The project also involves flood control, navigation and electric power generation. When completed the project area should be producing two or more crops per year instead of the single crop now produced by normal rainfall. Now an area subject periodically to flooding and drought it should become a rich area with a stable agriculture.

In many irrigated areas all over the world, problems of salinity are common and in several countries FAO experts are at work on such problems. In the Indus Valley thousands of acres of once productive land have been made idle by accumulated water and salts. An experiment is under way to lower the water table through pumping from wells with the water being blended with surface water and used for irrigation. The experiment has thus far been successful.

In the planning of new irrigation schemes, as in Iraq, drainage facilities are being planned as a part of the irrigation project and these should prevent the accumulation of salts. Detailed soil surveys are being made in connection with these irrigation developments. These surveys make it possible to identify areas unsuited to irrigation because of the high salt accumulation as well as otherwise facilitating the planning of the projects.

Salinity and related irrigation problems were studied in detail by a conference called by FAO in Iran in 1954. Technicians from the Near East countries met and reviewed the problems and needs for their region. It was their conclusion that considerably more attention was needed on drainage facilities for irrigation projects and that also there was need for expanded research and demonstration on irrigation practices. Work along these lines is now being developed and expanded in these countries.

In some areas where surface water resources are lacking ground-water is available. For service in such areas FAO has employed both geologists and well-drilling experts. In Syria, farming is dependent upon uncertain rainfall and much land is so arid as to be useful only for grazing. Geologic studies and well-drilling activities have provided much water for agriculture and livestock. Following the example of the FAO work the government of Syria has launched a large program of well-drilling.

A program in Baluchistan is directed to the development of large areas of land through improvement in water supplies. Wells have been drilled and plans made for further drilling. Steps are also planned for the improvement of vegetative cover on badly over-grazed catchment areas and also for the control of now unregulated flood waters.

Figure 5. *Left:* Delegates to the International Rice Commission meeting in Tokoy, Japan, are given a demonstration of a tractor adapted for rice cultivation. *Right:* Trainees of the FAO Agricultural Statistical Sampling Center in Thailand are weighing bundles of rice. The results are recorded for use in determining the accurate yield of plots.

Improving Land Resources

The conservation and improvement of the use of land resources takes several forms in the FAO program. Of foremost importance is the work on soil fertility. *A tremendous area of the world's agricultural lands is farmed in ways that tend to lower fertility levels. In such areas nearly all kinds of improvements in land use are dependent on improving the soil fertility.* Fertility trials are being conducted as parts of several irrigation development projects including those in Iran and Pakistan. In addition widespread investigations of soil fertility problems are under way in connection with the work of the International Rice Commission and elsewhere.

Training centers on soil fertility practices were held in India in 1952 and 1955 and have had much to do with stimulating interest in improved fertility in that part of the world. A conference on fertilizer distribution and use was held in Latin America and resulted in increased efforts to improve and expand fertilizer production and use in that region.

A closely related part of the work of FAO is the promotion of the development of improved pastures and range lands. *Some of the most abused lands in the world are the grazing areas, particularly in arid and semi-arid regions. Overgrazing, inadequate stock water development, lack of fertility and other problems give rise to serious erosion.* The mutilated range lands of several countries are a tremendous source of silt which threaten the life of irrigation works, increase the threat of floods and pollute water supplies. FAO experts in several countries are working on various aspects of this problem including conducting demonstrations in controlled grazing and assisting in the development of alternative feed supplies. A survey of the forage resources of India was made recently. Range and pasture work is under way in Syria, Iran, Iraq, Libya, Algeria, Mexico, Uruguay and Chile. In the Mediterranean area a special working party has been organized consisting of technicians from the governments of all the Mediterranean countries. This working party is particularly interested in promoting research on problems of pasture and forage supply in the area.

A major effort is now being made by FAO to increase the world's knowledge of its land resources. This takes the form of an expanded program of technical assistance on soil surveys. In 11 countries, FAO soil scientists are now at work and in 16 other countries such experts are expected to begin their work soon. For the most part these experts aid in the establishment of soil survey organizations. They train local technical personnel in modern techniques of soil survey. Maps and reports are being prepared in many countries. In several countries laboratories are being established to assist in the soil classification work and to facilitate the use of soil survey information in making land management recommendations to farmers. Research and demonstration programs on soil management are based on the new soil information and there also are plans for various kinds of land development projects such as clearing, drainage and irrigation.

An important line of work now developed by FAO is training in the maintenance of heavy land improvement machinery. In all parts of the world such equipment is coming into use. But all too often large numbers of expensive machines are idled or sometimes even abandoned because of lack of replacement parts and skilled mechanics. In connection with the Gal Oya Valley development in Ceylon, FAO has provided a team of engineers to set up a maintenance facility to care for some

400 big machines of all kinds. Shops were built and equipped, mechanics trained and an administrative organization developed to supervise the work. At present nearly all of the FAO technicians have turned their work over to trained Ceylonese personnel and the eventual goal of an organization staffed and operated efficiently by nationals of the country is now in sight.

Figure 6. FAO, at the request of several governments of Southeast Asia, established a regional training center in Manila for instruction in mechanical logging. This photo shows trainees being taught the best way of making log rafts.

Forestry Follows Regional Patterns

In this field FAO's technical assistance work tends to follow regional patterns developed by the various regional forestry commissions. The largest program is centered in Latin America where there are vast unused forests. Primary consideration is given in that region to national plans for the development of forest industries and for the cutting of the forests in ways which will perpetuate a continuing supply of forest products. The largest undertaking is a program of forestry development for the Amazon Basin in Brazil. This program includes the development of forest industries and of a considerable colonization of the area, based on employment in forest industries as well as in agriculture and fisheries. Training facilities for logging and saw milling have been set up to improve the efficiency of these operation areas and to eliminate waste in both forest and in mills.

A program in Chile includes a demonstration center for the teaching of silvicultural practices and logging and milling techniques. In addition, the FAO experts have been assigned to teach in the University of Santiago's School of Forestry.

Forest activities in the Near East relate to problems of reforestation which are linked with soil conservation and range management. Forests once covered large areas that are now little more than waste lands in this part of the world and reforestation of such areas could have several advantages. Forests are needed as sources of timber and fuel. They would also stabilize areas now subject to soil erosion and would aid in the improvement of water supplies. Main efforts of FAO experts in these countries are on the improvements in the organization of forest services, the development of appropriate legislation for the control of forest cutting, burning and grazing, the development of forest plantations and improved range management.

At the foundation of our economic growth are the raw materials and energy produced from our minerals and fuels, lands and forests, and water resources. With respect to them, I believe that the Nation must adhere to three fundamental policies: First, to develop, wisely use, and to conserve basic resources from generation to generation; second, to follow the historic pattern of developing these resources primarily by private citizens under fair provisions of law, including restraints for proper conservation; and, third, to treat resource development as a partnership undertaking —a partnership in which the participation of private citizens and State and local governments is as necessary as is Federal participation.

—DWIGHT D. EISENHOWER,

From the State-of-the-Union Message, January 6, 1956.

Personalized Soil Management Guides For Individual Farms in Illinois

R. T. ODELL, J. B. FEHRENBACHER, AND A. A. KLINGEBIEL

A new method of providing information on soils and their management for individual farms is being used in several Illinois counties where soil surveys have been completed recently. This system provides basic soils information essential for proper use and management of the land and facilitates the development of an integrated soil management program on each farm. Various agricultural workers in the county use this material in helping farmers solve their soil management problems.

SOIL SURVEY REPORTS consist of detailed descriptions of the soils in the survey area, technical information necessary for an understanding of the genesis and classification of soils, basic soil interpretations, including yield estimates of major crops, and management recommendations for the various soil types shown on a small-scale soil map of the area. It has been recognized for some time that county soil maps having scales of one to two inches per mile were too small for effective farm planning. This was generally true in the more humid sections of the country and in intensively farmed areas. A part of the difficulty with a small-scale map was the lack of adequate "paper space" on which to develop plans. In some cases, essential detail was also lacking on the small-scale maps. The soil management suggestions in many soil survey reports were often condensed or generalized too much to be of greatest value in developing plans on individual farms. Farmers who are concerned with the management of their soils are most interested in the management aspects of the report. Many soil management recommendations become obsolete with changing agricultural technology, whereas the remainder of the information in soil reports is of lasting value.

Consideration of the above factors and results of studies made during 1951 in Livingston County, Illinois, indicate that two kinds of soil survey publications are needed, as follows:

1. A large-scale (four inches to eight inches to one

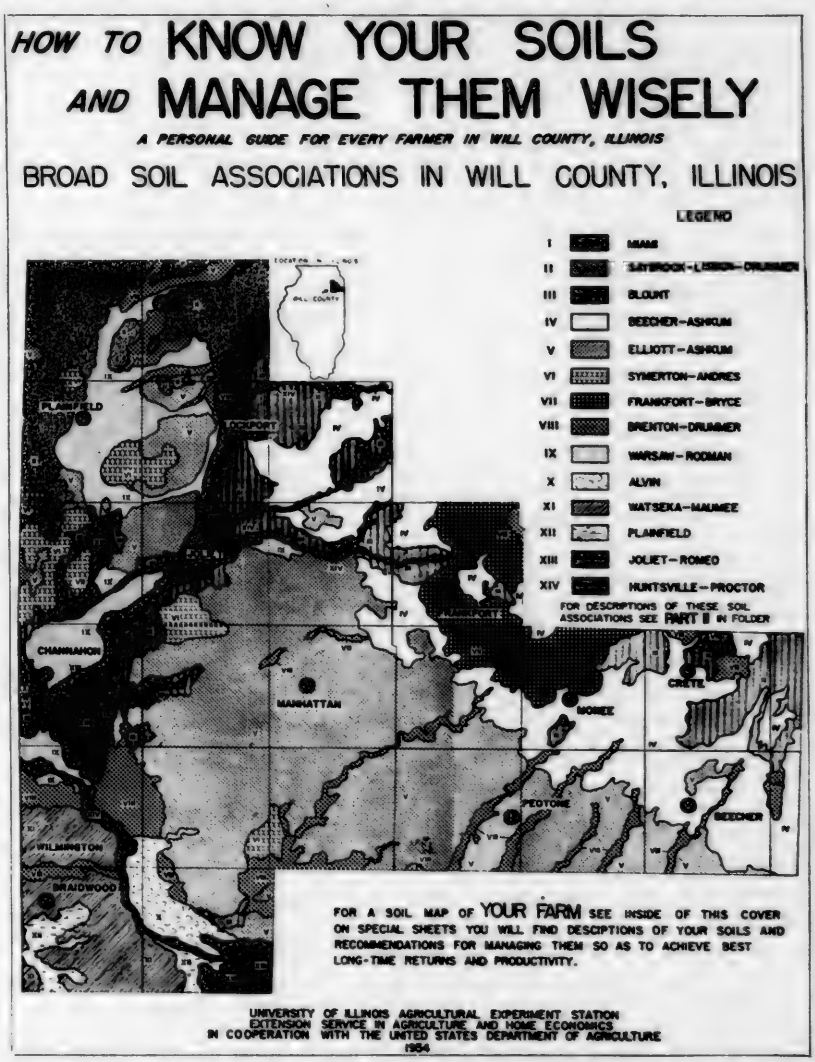
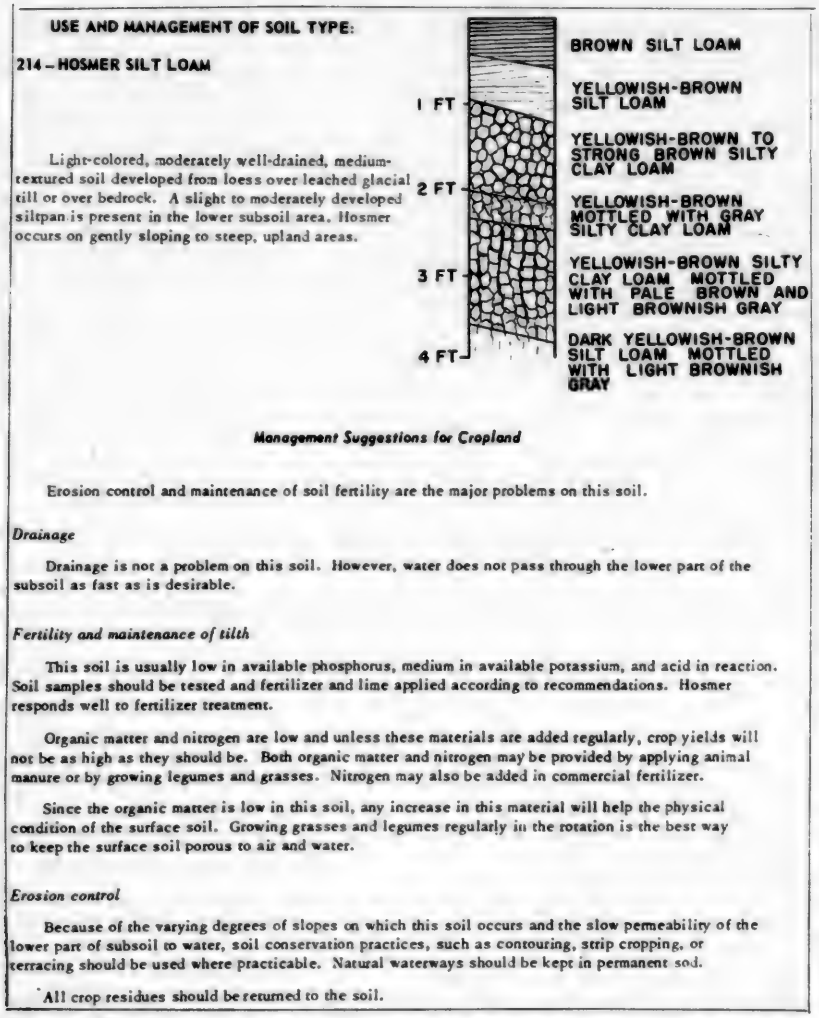


Figure 1. Soil association map of Will County, Illinois, which is on the front cover of the personalized soil management folder for this county.

R. T. Odell is professor of Soil Physics and J. B. Fehrenbacher is assistant professor of Agronomy, University of Illinois, Urbana, Illinois. A. A. Kingebiel is soil scientist Soil Conservation Service, United States Department of Agriculture, Washington, D. C.



USE AND MANAGEMENT OF SOIL TYPE:

214 – HOSMER SILT LOAM

Light-colored, moderately well-drained, medium-textured soil developed from loess over leached glacial till or over bedrock. A slight to moderately developed siltpan is present in the lower subsoil area. Hosmer occurs on gently sloping to steep, upland areas.

1 FT
2 FT
3 FT
4 FT
BROWN SILT LOAM
YELLOWISH-BROWN SILT LOAM
YELLOWISH-BROWN TO STRONG BROWN SILTY CLAY LOAM
YELLOWISH-BROWN MOTTLED WITH GRAY SILTY CLAY LOAM
YELLOWISH-BROWN SILTY CLAY LOAM MOTTLED WITH PALE BROWN AND LIGHT BROWNISH GRAY
DARK YELLOWISH-BROWN SILT LOAM MOTTLED WITH LIGHT BROWNISH GRAY

Management Suggestions for Cropland

Erosion control and maintenance of soil fertility are the major problems on this soil.

Drainage

Drainage is not a problem on this soil. However, water does not pass through the lower part of the subsoil as fast as is desirable.

Fertility and maintenance of tilth

This soil is usually low in available phosphorus, medium in available potassium, and acid in reaction. Soil samples should be tested and fertilizer and lime applied according to recommendations. Hosmer responds well to fertilizer treatment.

Organic matter and nitrogen are low and unless these materials are added regularly, crop yields will not be as high as they should be. Both organic matter and nitrogen may be provided by applying animal manure or by growing legumes and grasses. Nitrogen may also be added in commercial fertilizer.

Since the organic matter is low in this soil, any increase in this material will help the physical condition of the surface soil. Growing grasses and legumes regularly in the rotation is the best way to keep the surface soil porous to air and water.

Erosion control

Because of the varying degrees of slopes on which this soil occurs and the slow permeability of the lower part of subsoil to water, soil conservation practices, such as contouring, strip cropping, or terracing should be used where practicable. Natural waterways should be kept in permanent sod.

All crop residues should be returned to the soil.

Figure 2. The front section of a representative soil use and management guide sheet.

mile) detailed soil map of small tracts, preferably on an aerial photographic base, for farmers or other persons interested in managing individual farms. Major emphasis should be given to information concerning the proper use and management of the soils on the tract involved. Provision should be made for the periodic alteration of use and management information as soil technology changes.

2. A small-scale (one-half inch to three inches to one mile) soil map for the entire county with comprehensive soil descriptions, laboratory data, and other soils information of permanent value. This kind of publication would be used largely by technically trained agricultural workers who need soils information. It would also provide a permanent record of the results of the soil survey.

This dual system of publication was initiated in Will County, Illinois, during 1954. Soil management guides, described in Item 1 above, are now in use in Will, Johnson, and Williamson Counties, Illinois, where soil surveys have been completed recently. They provide a sound and convenient basis for developing an integrated soil management program on individual farms. The basic factors considered in developing such a program include the physical characteristics of the soils, results of soil tests, soil treatment, adapted cropping systems, erosion control practices, and drainage. This work is facilitated by the fact that the county agent and work unit conservationist use the same soil management guides in working with farmers.

Information Included in Guides

The soil management guides used in Illinois are assembled as a personal service for individual farms. The folder for each farm includes:

1. A soil association map of the county on the front cover of the folder (Figure 1).

2. A description of the soil association areas in the county which are delineated on the map on the front cover of the folder.

3. An explanation of the symbols which occur on the detailed map of the farm.

4. A reproduction of the detailed soil map of the farm on an aerial photographic base with a scale of eight inches equals one mile. A blank aerial photograph of the farm at the same scale for use in planning field layout, erosion control practices, drainage work, etc., is mounted with the detailed soil map on the inside of the front cover of the folder.

5. One or more (usually two to five) sheets (Figures 2 and 3) which describe the characteristics and management requirements of each soil type indicated on the detailed soil map of the farm. Items 1, 2, and 3 immediately above are the same for all folders in a particular county. Item 4 is distinctive for each farm, and only appropriate sheets (Item 5) are included for those soils which occur on the farm.

Soil management guide sheets (Item 5, above) are prepared for each soil type or for a group of soils having similar properties and management requirements. The

management sheets (Figures 2 and 3) include a brief description of the soil or soils plus a soil profile drawing. The major management problems are indicated and management suggestions are made for the soils when they are used for cropland, pasture, woodland, or wildlife.

Recommended crop rotations are given for each soil or group of similar soils by slope and erosion classes without conservation practices, as well as with such practices as contouring, strip cropping, and terracing. Specific suggestions on grades or amounts of fertilizers are not given since it is felt that the soil testing program, which is an integral part of a well-rounded management system, is the best place to make fertilizer recommendations for specific farms.

Use of Material

The soils management folders are designed to serve the needs of all farmers and of agricultural programs in each county, including:

1. *Soil testing program.* The results of soil tests made by the county agent for individual farms are returned to the farmer, together with the folder which includes a detailed soil survey map of the farm and appropriate soil management sheets. Complete soils information such as this provides an excellent basis for developing a sound soil management program on the farm.

2. *Farm planning activities of the Soil Conservation Service.* The folders and soil management sheets, together with a detailed soil and land capability map, are given to cooperating farmers as a part of the progressive farm planning procedure of the soil conservation district. Information on land capability and the detailed farm plan are also inserted at the appropriate time in the progressive farm planning procedure.

3. *Owners, tenants, farm managers, land buyers, cooperators in the Farm and Home Development program, and other bona fide users* of soil maps may obtain, upon request, a folder containing the detailed soil map of their farm and appropriate descriptive material.

These new soil management folders are distributed by both the county agent and the soil conservation district office in a closely coordinated program. If a farmer has a soil testing program with the county agent he is encouraged to talk over his farming system with the work unit conservationist, if he has not already done so. Those farmers seeking aid from the soil conservation district in planning their farms are encouraged to get their soils tested. In this way, either the county agent or the work unit conservationist can assist a farmer with his soil management program. He is encouraged by both agencies to make his program as complete as possible.

The management guides are not given county-wide

(*Continued on page* 193

Crop rotations

Most Intensive Crop Rotations Recommended for Soil Type 214 Occurring on Different Slopes and With Varying Depths to Subsoil

(See Part I for meaning of slope group and erosion or depth to subsoil symbols)

Slope group	Erosion or depth to subsoil	Land capability class 1/	Crop rotation or land use recommended for--			
			No practice	Contouring	Strip cropping	Terracing
B	1		R-R-G-M	R-R-G-M	R-R-G-M-M-M	R-R-G-M
	2		R-R-G-M-M	R-R-G-M	R-R-G-M-M-M	R-R-G-M
C	1		R-G-M-M	R-R-G-M-M	R-R-G-M-M-M	R-R-G-M
	2		R-G-M-M	R-R-G-M-M	R-R-G-M-M-M	R-R-G-M
	3		G-M-M-M-M	G-M-M-M-M	R-R-G-M-M-M	G-M-M-M-M
D	1		G-M-M-M-M	G-M-M-M-M	G-M-M-M-M	G-M-M-M-M
	2		G-M-M-M-M	G-M-M-M-M	G-M-M-M-M	G-M-M-M-M
	3		Pasture or woodland			
	4					
E	1		Pasture or woodland			
	2					
	3					
	4					
F	2		Pasture or woodland			
	3					

1/ For an explanation of Land Capability Classes, see your local Soil Conservation Service personnel.
R = Row crop; G = Small grain; M = Rotation hay or pasture; for example, a R-G-M-M rotation includes 1 year of row crops, 1 year of small grain, and 2 years of rotation hay or pasture in a 4-year period.

Other Management Suggestions

The following suggestions are made to get the maximum benefits from areas best suited for permanent pasture, woodland, or wildlife:

Permanent pasture

1. Apply lime and fertilizers according to the needs as indicated by soil tests.
2. Tear up old sod and reseed adapted legumes and grasses, such as Ladino clover, alfalfa, birdsfoot trefoil, red clover, lespedeza, tall fescue, bromegrass, timothy, and redtop.
3. On steep, eroded areas, cultivate only enough to renew pasture stands.
4. Clip weeds and regulate grazing to maintain legume and grass stands.

Woodland

1. This soil is very productive for forest; adequately-stocked stands of desirable species such as white oak, red oak, and black oak will grow up to 500 board feet per acre per year when properly managed.
2. Harvest mature, defective, and less desirable trees such as hickory, maple, and elm unless they are needed to provide vegetative cover.
3. Protect from fire and grazing.
4. Plantations of shortleaf pine and loblolly pine, if properly managed, will produce fence post material in 12 to 15 years and small saw logs in about 30 years.
5. Scotch pine and red pine may be planted for Christmas trees.

Wildlife

1. Plant or keep odd areas, pond areas, field borders, and permanent fences to adapted trees, shrubs, or grasses and legumes.
2. Protect from fire and grazing.
3. Protect ground-nesting birds and don't mow field borders until after small grain harvest time.
4. Stock suitable ponds with fish.

Department of Agronomy, University of Illinois Agricultural Experiment Station
in cooperation with
Soil Conservation Service, United States Department of Agriculture
1955

Figure 3. The back section of a representative soil use and management guide sheet.

Upstream Surface-Water Supplies — Need for Facts

LLOYD L. HARROLD

How much water does this stream carry in dry weather? Does it go dry at any time? When is the period of minimum flow? How often is the flow less than one cubic foot per second? What is the dependable flow 95, 80, or 50 per cent of the time? Is there enough surface water for my factory, our people, or my farm and livestock?

THESE ARE TYPICAL of questions asked by industry, city planners, farmers, and others vitally interested in water supplies in the headwater areas of our nation. The answers to these questions will dictate, to a degree, the extent of development of these upland areas for future use.

At watershed hydrology research stations like that near Coshocton, Ohio[1], studies are being made to help answer some of these important water-need questions.

Pertinent Research

Here we have measured, for about 18 years, the water flow in streams having drainage areas ranging from a few acres up to 4,580 acres. The United States Geological Survey has gaged the flow on an adjoining watershed of 17,540 acres. The area is typical of much of the hill land in southeastern Ohio, western Pennsylvania, West Virginia, and Kentucky. Soil is residual, mostly Muskingum silt loam of shallow topsoil and fairly permeable subsoil. Parent material is mostly shale or sandstone.

At various depths below the land surface are layers of coal and impervious clay. Percolating waters accumulate on top of the clay from which they flow laterally, emerging as spring and seep spots on the hillsides. From there they run into streams and are measured as surface flow at the gages.

Vegetative cover of the entire area is comprised of about 25 per cent woodland, 55 per cent grassland, and 20 per cent cultivated and other uses. Cultivated land is about half in row crop and half in small grain.

Estimates of reliable and usable water yield in the larger streams of a state may be made from long-time records collected by the U. S. Geological Survey. Basic data of runoff from small agricultural watersheds in the headwater areas of our nation's river systems are, however, noteworthy for their scarcity and brevity. Recognizing this void and the possibility of partially filling it, the Watershed Hydrology Section of the Soil and Water Conservation Research Branch, Agricultural Research Service, started in 1954 to compile and publish runoff data from its several watersheds in different parts of the country. The first of these water-yield publications is expected to appear late in 1956. Others to follow will include data compilations to meet many different needs.

Runoff data from the Coshocton Station are used herein to illustrate the many ways in which the results from watershed hydrology studies may be put to use to answer some of the questions herein before propounded.

Nature's Take

It is often said that "Feast" or "Famine" characterizes our water supplies. Figure No. 1 shows a *small* feast — excess water flow when we can't use it, can't store it, or don't want it. The flow in this photograph is not very excessive—we have had flows several feet deeper at this station. Figure 2 shows a "famine"—no flow from this 2,570-acre watershed. In 18 years of record, there were eight years when the minimum monthly flow was less than 0.01 inch and one year when there was no flow for one month or more.

Maximum annual flow (Table 1) in the 18-year period was 19.00 inches for the 2,570-acre watershed. Minimum flow from this watershed amounted to only 4.21 inches. Precipitation minus runoff in the first case was 27.86 inches and in the latter year, 29.81 inches. These values, precipitation minus runoff, are sometimes referred to as "Nature's Take" or water loss. In places where there is no unmeasured deep seepage of water from the basin, "Nature's Take" may be considered as that part of precipitation that is transferred to atmospheric moisture and no longer available for use in the basin. Precipitation was

Table 1. Maximum and minimum annual[1] precipitation, water flow, and "Nature's Take" for different-size watersheds, 1937-55, near Coshocton, Ohio.

Watershed size	Year of maximum flow			Year of minimum flow		
	Precipitation	Flow	"Nature's[2] Take"	Precipitation	Flow	"Nature's[2] Take"
Acres	Inches	Inches	Inches	Inches	Inches	Inches
17,540	44.78	22.19	22.59	34.02	5.15	28.87
4,580	44.78	23.34	21.44	34.02	4.37	29.65
2,570	46.86	19.00	27.86	34.02	4.21	29.81
349	46.86	18.13	28.73	34.02	4.02	30.00
122	46.86	14.22	32.64	34.02	3.50	30.52
74	44.24	18.25	25.99	28.94	2.15	26.79
29	43.53	13.92	29.61	32.12	.94	31.18

[1] Annual values are for the 12-month period, October 1 to September 30. As ground-water levels and soil moisture are usually at a minimum at the end of September, the 12-month water values are likely to be affected the least by carry-over storage changes.

[2] "Nature's Take"=precipitation minus runoff.

Lloyd L. Harrold, a member of the SCSA, is project supervisor, Watershed Hydrology Section, Soil and Water Conservation Branch, ARS, Coshocton, Ohio.

greatly different in these wet and dry years—amounting to 46.86 and 34.02 inches, or a difference of 12.84 inches. "Nature's Take" difference was only 1.95 inches. In other words, evaporation and transpiration takes its toll of precipitation in the humid section of the country almost without regard of the amount of precipitation.

If "Nature's Take" is expressed in percentage, the values would be 59 per cent of precipitation for the high runnoff year and 88 per cent for the low runoff year. These percentage values appear to be greatly different whereas the actual amounts in inches were somewhat the same. Percentage values could be misleading and should be used with caution.

Expected Water Yield

Farm, city, or industrial use of water may require reservoirs to store water to meet the needs in periods of little or no runoff. When such are possible, the design engineer must have information on the yield of water for periods of one, two, or even three years. He may design the water storage and use system on a safe supply for 98 per cent of the time (49 years out of 50), 96 per cent of time (48 years out of 50), 80 per cent (45 years out of 50), or 50 per cent of time (25 years out of 50). Data for these expectancies and for watersheds of 17,540, 4,580, and 2,570 acres appear in Table 2. The 96-per-cent-of-time safe flow value for the 2,570-acre watershed are 5.1 inches for one year, 13.9 inches for a two-year period, and 24.2 inches for a three-year period. Similar values for the larger watersheds are slightly greater.

Relation to Watershed Size. Runoff data for the Coshocton watersheds indicate that water flow amounts (yield) increase as the size of drainage increases. The increment of increase in water flow appears to decrease as the watershed size increases. For example, the 96-per-cent-of-time two-year runoff values for the 2,570- and 4,580-acre watersheds (Table 2) are 13.9 and 14.3 inches, respectively. This is an increase of 0.20 inch per 1,000-acre increase. From 4,580 to 17,540 acres, the increase in runoff per 1,000-acre size increase is 0.13 inch.

Runoff from small watersheds, 20 to 100 acres, is quite small as a considerable amount of soil water drains to such depths that it is not gaged as surface flow. This deep seepage comes to the land surface farther down the hill and becomes part of the gaged surface flow. Within the range of watershed sizes reported here, as the drainage area increases more of these seep spots fall within the watershed—thus increasing the flow amounts. This rate of increase in numbers of springs and seeps per unit of drainage area is greatest in the size category up to 3,000 acres and declines for watersheds beyond about 5,000 acres in size.

Table 2. Water yield for one-, two-, and three-year periods for watersheds of 2,570, 4,580, and 17,540 acres for different frequencies, near Coshocton, Ohio.

Watershed size	Water yield reached or exceeded											
	98 per cent of time			96 per cent of time			80 per cent of time			50 per cent of time		
	1 Yr.	2 Yr.	3 Yr.	1 Yr.	2 Yr.	3 Yr.	1 Yr.	2 Yr.	3 Yr.	1 Yr.	2 Yr.	3 Yr.
Acres	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
17,540	4.7	11.7	22.2	7.1	16.6	26.6	11.0	24.0	37.3	14.7	29.4	44.4
4,580	4.1	11.1	21.9	5.4	14.3	25.4	10.8	23.7	36.6	14.2	28.5	43.0
2,570	3.7	10.3	20.1	5.1	13.9	24.2	10.4	22.8	34.8	13.5	27.2	41.0

Figure 1. Excess water wasted. We don't need it now.

Figure 2. Now we need water and the stream is dry.

In many sections of the country, the above watershed-size runoff relationship does not hold true and it is not known to what extent this holds true on larger watersheds in the eastern part of the country. In fact, in Nebraska and several of the western states, water-flow totals are

[1] Operated by Agricultural Research Service, U. S. Department of Agriculture, in cooperation with the Ohio Agricultural Experiment Station.

Table 3. Minimum water flow from a 4,580-acre watershed near Coshocton, Ohio for periods of 1 to 12 months 1938-55.

Length of period	Runoff amount
Months	Inches
1	0.0007
2	.0027
3	.0056
4	.02
5	.05
6	.13
7	.22
8	.37
9	.46
10	1.63
11	2.58
12	3.64

less as the watershed size increases. This is due in part to seepage of water from the stream channel into the bed.

Minimum Flows. In some areas, surface storage facilities may be lacking or so small that runoff supply values for periods of less than a year are needed. In this case, water yield values for periods of one to several months may need to be derived. From the 18-year runoff record at our 4,580-acre watershed, we have compiled data on minimum flow as shown in Table 3. This shows that the minimum single-month flow in 18 years was 0.0007 inch; for two consecutive months, 0.0027 inch; for six-month period was 0.13 inch. During the period of least flow, the data show that it would take from eight to nine months to yield a runoff total of 0.25 inch and almost ten months to yield a total of 1.0 inch. The minimum flow for a 12-month period was 3.64 inches, whereas that for the calendar year was 4.37 inches.

Seasonal Flows. Some water problems may require estimates of dependable stream flow for short seasonal periods. If the problem is irrigation, the water flow for the months of June, July, and August in Ohio would be critically important. Records from our 4,580-acre watershed show minimum five-day flow for June to be 0.054 cubic feet per second; July, 0.003; and August, 0.005. For the 17,540-acre watershed similar values are 0.6, 0.1, and 0.1 cubic feet per second. For the 2,570-acre watershed, the values were 0.03, 0, and 0. Certainly these small flows would not provide much water for irrigation.

The period of record at Coshocton, 1938-55, has been almost ideal for evaluating water yields. With a long-time average annual precipitation of 39.94 inches, there were three years of 30 inches or less within the period of record. Two of these years were consecutive—1953 and 1954. When such happens, extremely low water yield is experienced.

Limitations of Data

Water-yield studies like that described above are meeting a public need. With so few stations of this type in this country, the available water-supply data can help to meet only a few of these needs. There is a danger in using data from one problem area in other areas with widely different conditions. The actual variation from one problem area to another may be quite large.

In order to provide adequate data on which upland water-supply systems can be designed with economy and safety, it will be necessary to set up a more comprehensive program of data collection and analysis.

Molybdenum—Essential to Well-Being of Plants and Animals

(Continued from page 164)

tive is supplied, the animal may die. Toxicity of such forage is much less when it is fed as hay than when fed in the green state.

Copper Sulfate Cure for Excess

Notable areas of serious molybdenum toxicity to livestock have been found in California and Florida. The concentration at which this develops depends largely on the copper content of the forage as well as on the amount of molybdenum in it. These two elements have antagonistic effects. Molybdenum is an antidote for copper poisoning, such as occurs in cattle grazing in areas close to copper deposits. And copper sulfate, at a rate of one to three grams daily per 1000-pound animal, is the standard antidote for molybdenum poisoning. The copper sulfate has two effects. It supplies the needed copper and its sulfate radical tends to reduce absorption of molybdate from the alimentary tract.

Another means of dealing with the problem of excess molybdenum in forage crops is to grow them to the hay stage on the soil in question, harvest them, and haul them off the field. The excess molybdenum can thus be carried away with the crop. This method can be applied also in the unlikely event that excess molybdate had been applied as a corrective for deficiency of the element.

Two Ounces to One Pound Per Acre

But excessive use of molybdenum should be avoided. An application of two ounces of molybdate per acre to grazing lands may be adequate for several years. Heavier applications, up to one pound per acre annually, may be required for alfalfa, cauliflower, and other legume and vegetable crops with high molybdenum requirements. And such rates of application may also be required on acid soils and on those that are high in manganese or sulfur or low in phosphate.

Those who desire more details concerning molybdenum in relation to crop and livestock production can obtain copies of the complete issue of SOIL SCIENCE, or reprints of the symptoms of deficiency, by writing Climax Molybdenum Company, 500 Fifth Avenue, New York City, through whose courtesy the color plates were developed.

11th Annual Meeting of the SCSA, Tulsa, Oklahoma, Oct. 15-17

Tulsa skyline at night. The International Petroleum Exposition is in the foreground. Downtown Tulsa is three miles away in the background.

Oklahoma Extends You a Cordial Welcome . . .

The SCSA members of Oklahoma's six chapters are happy and proud to be your hosts for this convention.

All committee chairmen and members for the annual meeting have been named and already have plans well under way for your entertainment and comfort while in Tulsa. They are working under the general chairman of Local Arrangements, Myron A. Hurd of Claremore. Co-chairmen are Warren McCarty of Tulsa and H. M. Chambers of Stillwater, who is a member of the National Council and Chairman of the State Council of all SCSA Chapters in Oklahoma.

Some of the highlights of the plans made by the local arrangements committee are: A tour of Double Creek near Ramona to see a pilot watershed treatment program for upstream flood prevention; a free tour to Will Rogers Memorial at Claremore and a luncheon for the ladies; a free barbecue for all (one of Clay Pott's Oklahoma features) and entertainment in the form of Indian dancing, square dancing and barbershop singing. Many souvenirs will be given.

Ladies who desire to visit Tulsa's shops and department stores or attend a theater may do so by carefully

Left: Lower Lake Spavinaw. This lake plus upper Spavinaw Lake five miles upstream provides Tulsa's municipal water supply. It is adequate for a city of half a million. *Right:* The Will Rogers Memorial at Claremore attracts thousands daily. In the foreground is the tomb of Will Rogers, Oklahoma's own beloved Cherokee son, world renowned cowboy, humorist, entertainer, columnist and aviation enthusiast.

Society members and others planning to attend the 11th annual meeting in Tulsa should make their reservations at an early date. An excellent choice of economical hotel and motel accommodations are available. See page 202 for complete reservation information.

William J. Endersbee, chairman of the annual meeting program committee, has announced the plans on page 200 of this issue of the Journal. Many leaders from all phases of the land use movement will appear on the program.

Make your plans right now to be in Tulsa, October 15-17, 1956. And bring your wife and family as plans have been made for their entertainment.

budgeting their time. Clean and comfortable motels and hotels at reasonable rates are available for those who desire to budget their expense. Write Gene Arwood, Convention and Visitors Bureau of Tulsa Chamber of Commerce, 616 S. Boston, or chairman of the local Arrangements Committee for information.

Many of you who drive will want to allow an extra week or more to see northeast Oklahoma, an area rich in history, romance and worth while tourist attractions.

SCSA members from six Oklahoma chapters will greet you in Tulsa. They will be from the Northeast Chapter of Pryor; the Central Chapter of Oklahoma City; East Central Chapter of Muskoges; South Central Chapter of Durant; Stillwater Chapter of Stillwater; and Big Hunt Chapter of Anadarko. You will also be greeted by members from the East Texas Chapter of Nacodoches; Fort Worth Chapter of Fort Worth, Texas; the Ozark Chapter of Fayetteville, Arkansas; and the Kansas Chapter of Manhattan.

Land of the Cherokees, Creeks and Osages

When the various tribes of Indians were moved by the United States Government to reservations in Oklahoma soon after 1800 it was thought that the natural supply of game and other resources was inexhaustible.

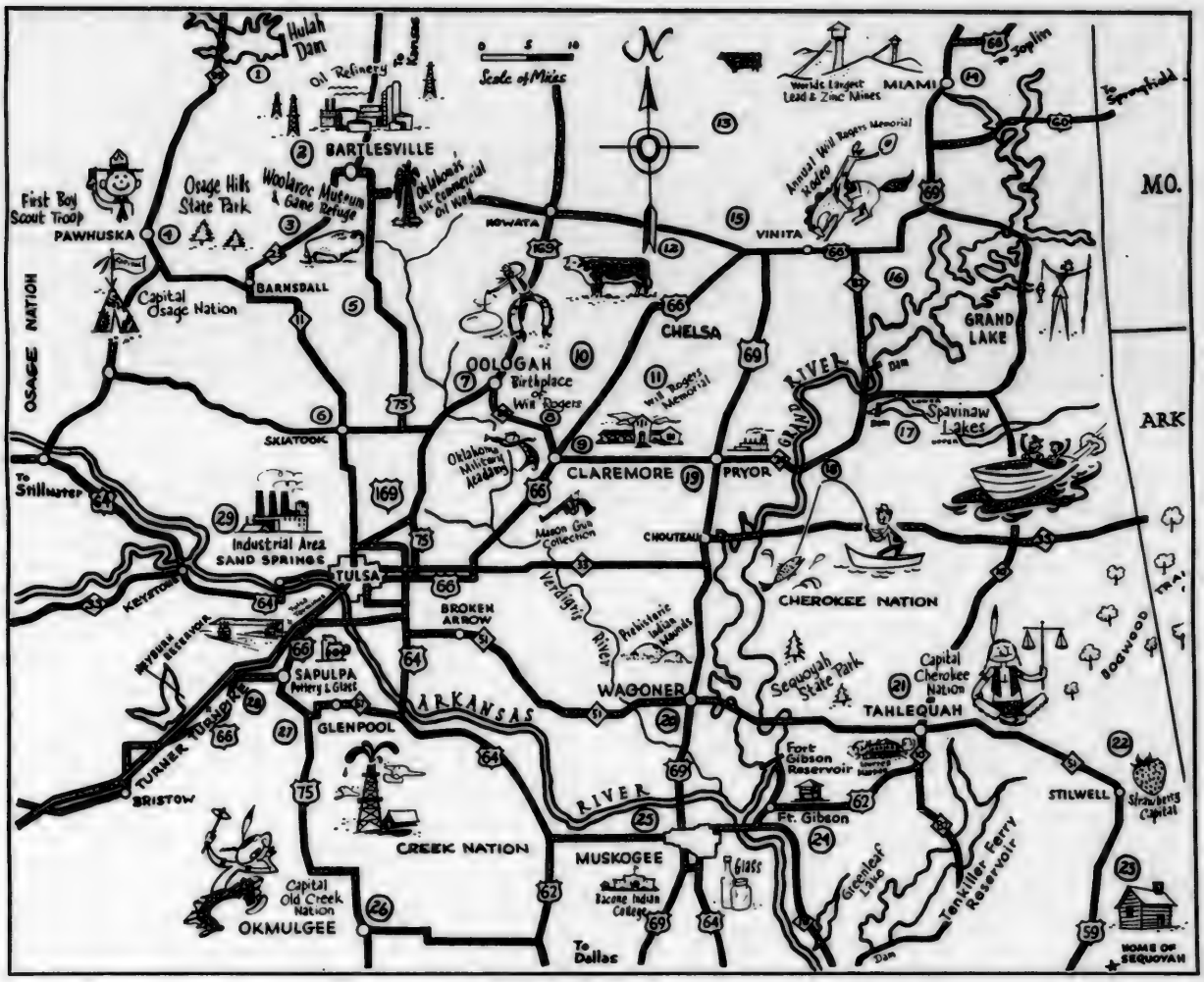
This was a beautiful prairie country with rolling hills, sparkling clear streams, and tall prairie grasses waving in the breeze. Travelers looked upon the land with an eye for settlement.

Like a flooding torrent, white men overran the Indian lands and by one means or another, acquired titles to most of it. The native culture of the redman made its final stand against the white man here in Oklahoma where the five civilized tribes were crowded together on reservations with other tribes of Indians from the prairies, the plains, and the southwest deserts.

The bloodlines of the Indians have become so amalgamated with whites that it is difficult to find a full blood anymore. While this noble race has lost much of its purity of blood lines, its influence lives on. The Indian has left a rich heritage of names given to people, villages and streams which sound like birdsongs, laughing brooks, rippling waters, wailing animals, or the wind singing in the trees.

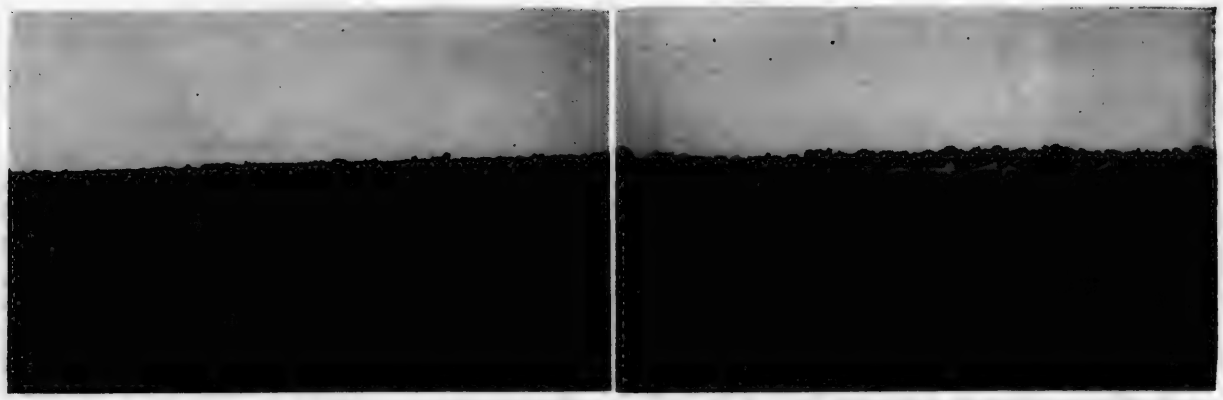
Northeast Oklahoma, the original home of the Cherokee, Creek and Osage, is like a beautiful pastoral landscape painting, especially in the spring and fall, and many tourists who visit this area write of its scenic beauty.

Tulsa State Fairgrounds and International Petroleum Exposition. SCSA delegates will enjoy one of Clay Potts' famous barbecues in the Educational Building which can be seen in the center foreground. Other buildings shown include the Agricultural Building which houses County, State and Federal Agricultural Agencies.



Points of Interest in Northeast Oklahoma . . .

1. **Hulah Dam on Caney River.** Built by Corps of Engineers as part of *the Verdigris River watershed planning program.*
2. **Bartlesville.** Home of Phillips Petroleum and Price Oil Companies. Site of Oklahoma's first commercial oil well.
3. **Woolaroc Museum and Ranch.** One of the world's largest privately owned collections of western and Indian art relics. Admission free.
4. **Pawhuska,** Capital of Osage Indian Nation; *center of large ranching operations in the famous "Bluestem Bowl" or native bluestem grasses.* Famous "Western Cavalcade" held here annually in summer.
5. **Ramona.** *Site of Double Creek Upstream Flood Prevention Pilot Watershed Project, which will be visited on the scheduled tour Monday afternoon, October 15.*
6. **Skiatook.** Site of Rogers Trading Post in Indian Territory days; also of old Quaker Presbyterian Mission School and first courthouse of Cooweescoowee District, Cherokee Nation.
7. **Oologah.** Birthplace of Will Rogers, and site of Clem Rogers home built in 1875. Site of *Oologah Dam* now under construction by Corps of Engineers, U. S. Army.
8. **Claremore Mound.** Site of the last battle between the Osage and Cherokee Indians in 1818. Grave of Chief Clermont of the Osages was supposed to be on top of this mound.
9. **Claremore.** Twenty-seven miles from Tulsa. Probably has more tourist attractions than any city its size in America. Some of the more important attractions include:
   - The National "Will Rogers Memorial" Shrine will be visited by ladies on tour Tuesday, October 16.
   - Davis Gun Collection in Mason Hotel, 61,905 guns including 50 rare cannons, are on display. Reputed to be the world's largest privately owned gun collection. Included in the collection are 200 handcuffs and prisoner's items, 600 animal horns, 1,250 beer steins, 200 pieces of rare china and cut glass, 20,000 Indian relics, 100 musical instruments and 5,000 rounds of ammunition.
   - Oklahoma Military Academy. Famed for its precision drill teams in parades. The Academy is across the street from Will Rogers Memorial and will be visited by ladies on tour, luncheon free, Tuesday, October 16.
   - Claremore Lake. Visited by thousands annually for fishing, boat racing, picnicking and outings.
   - Claremore Mineral Water Baths. Discovered before statehood. Will Rogers quipped *"It will cure you of any-*



Left: Terracing, strip-cropping and contour farming are practices used by many farmers on cropland in Northeast Oklahoma. *Right:* Sprinkler irrigation is a new practice. It started during the drought of 1951.

thing but being a Democrat." Will Rogers Annual Rodeo at Round Up Club Grounds in July. Home of the Pocahontas Indian Women's Club. Organized at Oowala, Indian Territory, in 1899 and active ever since. Several charter members are still living. This club will be host to the ladies on Tuesday, October 16.

10. **The Round Mound Country,** 10 miles north of Claremore, where homes still stand which were built from 1875 to 1885 by Major Lipe, Cherokee treasurer, Charles McClellan, sheriff, "Doc" Lane, community doctor, and Clem Rogers, father of the famous Will Rogers, comedian and ambassador of good will. The old Lipe Trading Post called Oowala, I. T. (where Will Rogers got his first mail), and John Bullette's Trading Post, Mount Claremore, I. T., were in this community. The grave of Gid Graham, *"Friend of the Hunted,"* is on top of one of these round mounds.

11. **Foyil.** Four miles east. World's largest Totem Pole (90 feet tall). Privately owned, admission free. It is the handiwork of N. E. Galloway, who is a retired wood craftsman. He also has a collection of hand-made violins, each made of wood from various nations of of the world. Visited by thousands annually.

12. **Alluwee.** Formerly Lightning Creek Postoffice, established about 1867 by Chief Charles Journeycake of the Delawares whose forebears met Henry Hudson at the boat on the banks of the Hudson River in New York. The Journeycake home and old colonial home of J. E. Campbell of Virginia still stand.

13. **Large ranches** *with native bluestem grass grazing lands between the Kansas line and Vinita and Nowata. The cross bred Brangus cattle were developed here.*

14. **Miami.** Home of Charles Banks Wilson, well-known western Indian artist. World's largest lead and zinc mines at Commerce, Cardin, Picker and Quapaw. One of the abandoned mines is lighted and maintained for tourists to see.

15. **Vinita.** Home of Will Rogers Memorial Rodeo held annually in July or August. Home of Grand River Dam Authority. First Cherokee town in Cooweescoowee District.

16. **Pensacola Dam.** *Known as Grand Lake of the Cherokees. Longest multiple arch dam in the world.*

17. **Spavinaw Lakes.** Upper and Lower. Spavinaw Hills State Park. Source of Tulsa's municipal water supply, fed to Tulsa by gravity flow. Favorite fishing, boating and outing centers with a wide range of resort facilities. Scenic splendor, especially in the Spring and Fall.

18. **Salina.** Site of Chouteau's Trading Post—established by Frenchman Pierre Chouteau in 1795. It was Chouteau who induced the Osage Indians to migrate from Missouri to the prairie country because of the great abundance of buffalo, deer, turkey, bear and fur-bearing animals.

19. **Pryor.** Industrial sites. Among the plants located here is the Grand River Chemical fertilizer plant of Deere and Company, manufacturers of Vitrea.

20. **Wagoner-Population.** *Site of Fort Gibson Reservoir. Sequoyah State Park. These, plus Spavinaw Lakes, Grand Lake, Tenkiller, Greenleaf, Claremore Lake and the Grand and Illinois and other rivers provide a fishing paradise and playground for Oklahomans.*

21. **Tahlequah-Population.** Capital of Cherokee Nation after the removal of the Cherokee Indians to this area from North Carolina, Georgia and Tennessee in 1837 to 1840, over the infamous *"Trail of Tears"* by the United States Army, under the orders of President Andrew Jackson. The Cherokee County courthouse was the former Cherokee Capitol. The Northeast Oklahoma State College was formerly the Cherokee Female Seminary. Ruins of the Male Seminary lie four miles south.

22. **Stilwell.** Called the Strawberry capital of Oklahoma.

23. **Home of Sequoyah,** George Guess, inventor of the Cherokee alphabet, a remarkable invention which Cherokees learned readily to use for communication.

24. **Fort Gibson.** Old U. S. Fort Gibson, restored, established by United States in 1824.

25. **Muskogee.** Glass manufacturing and distributing center. Home of Bacone Indian School, Oklahoma School for Deaf, Dumb and Blind, and the Veterans Hospital.

26. **Okmulgee.** Capital of Old Creek Nation is maintained as a museum. Home of Oklahoma Technical College.

27. **Old Glenpool-Kiefer** oil fields which ushered in the fabulous oil boom days of Oklahoma soon after statehood and made headline news the world over. These fields and similar strikes at Chelsea, Nowata, Bartlesville, Okmulgee and the Osage Nation established Tulsa as the Oil Capital of the World.

28. **Sapulpa.** Famous for pottery and glass manufacturing.

29. **Sand Springs.** Tulsa's industrial area. Home of Page Foundation and Commander Cotton Mills.

30. **Tulsa.** One of America's fastest growing and most beautiful cities.

Local watershed groups should be aware of all their land and water problems.

Photo Courtesy Michigan Department of Conservation

Planning and Developing "Our" Watershed Resources . . .

Too many people assume that watershed programs are Federally-sponsored projects. In the main this is not true nor should it be.

Experience has proven that watershed programs are most successful when they are conceived and developed by local people. Government assistance at all levels may be highly desirable in both planning and financing. However, such aid should be available at the request of local watershed promoting groups and at a time when local facilities are inadequate to properly accomplish the project. *In a democratic atmosphere, free from catastrophic influences, the principle should be followed whereby agencies must not do things for people but aid them to accomplish things for themselves. Historically such a procedure may be slow, costly, and often beseiged with error. However, a project that is planned, executed, and owned by local people has a long-time vitality characteristic of the best traditional American spirit.*

This discussion concerns some of the characteristics of local "home town" organization and effort which have accomplished watershed management or have laid a solid foundation of public opinion and participation upon which government assistance rests. The following is one example of how a watershed was developed.

Getting a Watershed Program Underway

Two applicants for assistance from the Hastings Soil Conservation District were experiencing flooding of valuable pasture and cropland each spring for several years. A side road over which farmers in the community traveled was occasionally impassable due to flooding and wash-outs. A preliminary survey by the work unit conservationist of the Soil Conservation Service showed that ten other farmers in a small watershed were contributing most of the water but also large quantities of topsoil. A director of the district governing body who lived in the area discussed this problem individually with several of the leading farmers concerned. He found that they were aware of the road situation but unaware of the extent of damage to the land. They expressed interest in learning more about it. As a result the district governing body invited the 12 farmers to meet with them at one of the farm homes in the watershed. Ten of the 12 came to the meeting. After the purpose of the meeting was explained, the group visited the two farms and the road affected by the damage. Next a trip was made over parts of other farms to observe water channels and erosion damage. The ten farmers indicated considerable interest in the water problem. They set a date for a future meeting at another farm home and agreed to urge the other two farmers in the watershed to attend. At the following meet-

Photo Courtesy Michigan State Soil Conservation Committee

To be "our" watershed local people must be "in on the borning." Everyone can have his say in small group dicussions.

Photo Courtesy Brandywine Valley Watershed Association

There is no substitute for public understanding. Field trips and demonstrations are helpful in getting people to actually see land and water problems and how they can be corrected.

ing the work unit conservationist and the county agriculture agent presented additional facts concerning the water management problem and showed slides of practices that would control water run-off. The local highway commissioner was also present. Considerable discussion followed on how their problem might be corrected, the probable benefits and steps to be followed to correct the situation. Individual farmers asked for additional data about their own farms. The 11 farmers decided to form a watershed group and elected one of their own members chairman and another its secretary. At this point the soil conservation district governing body withdrew from active participation although it agreed to make its facilities available to the group. All but one agreed at that time to become district cooperators. Additional meetings of the watershed group followed under its own direction as land capability surveys and farm conservation plans became available. The watershed group discussed each farm plan and the various methods available to control run-off and conserve water. As specific water run-off prevention and control measures and costs were discussed and agreed upon, representatives of the Agriculture Conservation Program were asked to consider cost-sharing on a group basis. Soil and water conservation loans became involved and assistance from foresters and wildlife technicians were also obtained. Simple practices such as tree planting were started immediately. The pattern of land use in the watershed began to change and the water problem was eventually brought under control. Progress was satisfactory and a small watershed program had become a reality.

Some Basic Development Procedures

This is a simple example, stripped of detail but most of the elements necessary for local initiation and direction of a successful watershed program were involved.

- There was a significant problem
- This problem could not be controlled by the individuals suffering damage
- Most or all people in the watershed had a direct interest in the situation
- Project initiation was provided by an organized body with no vested interests
- Leadership was "sounded out" before any action occurred
- Preliminary or exploratory meeting was called in the area affected
- Problems were discussed and possible approaches to action were considered
- Local organization of people concerned occurred
- Plan of procedure to gain detailed knowledge of situation was agreed upon
- Teamwork between assisting public agencies was developed
- Accurate and detailed data was assembled concerning problems and possible costs involved
- Plans for correcting the problems were proposed and a decision was made for action
- Some corrective measures were started immediately
- Long-time program was put into action
- Progress was closely followed by the group

The Finney Creek Watershed in Kansas got its start when a farm leader and a few of his neighbors got together to talk about their mutual water problems. After this initial discussion, a meeting was called for all the farmers in the watershed area. Water problems were fully discussed and the advantages and disadvantages of a watershed organization considered. At the end of the meeting the farmers elected a steering committee to prepare a plan of action. The watershed program had its "grassroots" beginning.

Experience with watersheds has shown that an informed, organized group of local people representing the major interests in the watershed is one of the most decisive factors in its success. Such an organization is important even though a legal body such as a conservancy district,

Today's youth are tomorrow's leaders. Acquaint them with watershed problems now.

Photo Courtesy Michigan Department of Conservation

watershed district or development district may eventually be required.

Often financing by local interests is needed for a considerable period to obtain necessary surveys and plans of action before actual treatment can begin. Dependable financing is therefore necessary for two separate operations: (1) preliminary surveys and developing a plan of action, and (2) defraying costs of actual treatment and maintenance. In some cases where damage may occur only periodically, it is difficult to maintain public interest to the point where financial support is available during both steps of the project. It is tragic to note that several watershed projects have collapsed during the present year from lack of support at the point where actual treatment was to begin.

These Factors Are Important

Let us examine some of the important factors to consider in *(1) initiating a watershed program, (2) developing interest in the problems, (3) creating an awareness as to their significance and possible solution, (4) instilling a desire for action, and (5) maintaining interest in the project.*

A watershed project may be initiated by a public spirited citizen or by a small group such as a soil conservation district governing body. Experience has shown it is better if individuals promoting the project do not represent a vested interest. Regardless of their good intentions, the motives may be questioned by allied groups. Since it is essential that a watershed project get off on a right foot, it might be well to discuss the general problem individually with a few leading citizens including leaders of major organizations from which support will eventually be necessary. If there is general interest in the water problem the next step might be a get-together of this small group of leaders to discuss the entire subject. This group should only be the initiating group and not the one which will eventually sponsor the project. If the expressed attitude is favorable it should represent the nucleus group for taking the next important step.

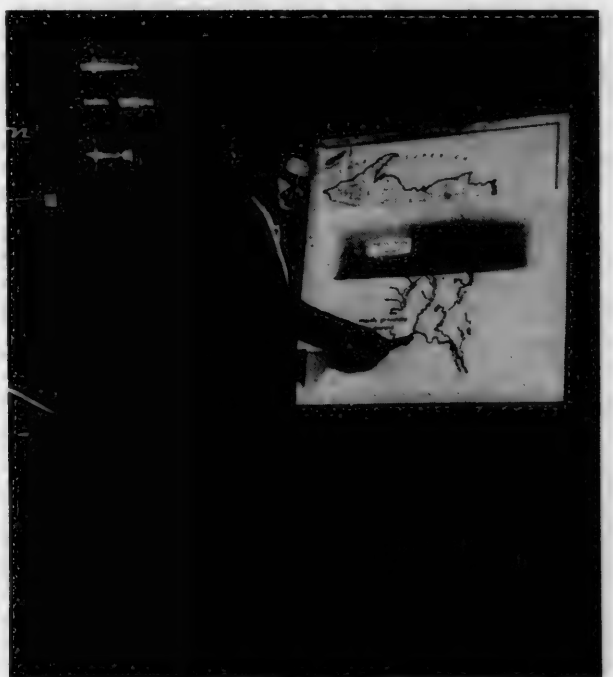


Photo Courtesy Michigan Department of Conservation

Television along with radio and the press can help sell a watershed program.

Some watershed authorities believe that this initial group should be composed largely of individuals in authority or quasi-authority such as representatives of a soil conservation district governing body, chamber of commerce, chairman of the board of supervisors, mayor, county judge, township supervisor and others. This group might well seek counsel of some individual or individuals who are familiar in a general way with the watershed problem at hand. If the situation is an impossible one, it should be known before public opinion is aroused. It is logical that the next step should give general publicity to create public interest.

A meeting of representatives of all groups who might have an interest in the problem should next be arranged. Here is the time to include leadership on a wide basis. It is essential that these groups be brought in "at the borning." It is important that this group feel that they are in on the beginning, that no decisions have been made and no plans concocted, that the purpose is to review the situation, and to decide on the necessary corrective steps. If possible, preliminary facts and figures concerning the problem might be presented for discussion. Later it is well to arrange a tour of the area where participants can see first-hand the problem being discussed. At this time or following meetings, discussion will concern possible corrective measures. *It should be made clear that the primary purpose of the watershed group is to gain accurate information on the problems and possible solutions. Program development has been killed at this point when solutions and costs have been discussed at random prior to the necessary detailed surveys.*

Organizing the Watershed Association

If the group is in accord that detailed information concerning the problems of the watershed is desirable, the next logical step is the formation of a watershed association with its own officers. An early decision will have to be made as to financing costs of the survey depending upon probable size and scope of the project. From here the job is to accumulate data. Public agencies having an interest in the problems should be assembled to discuss facts which each of them may already have or which they may be willing to obtain. The job of providing a cordial atmosphere of teamwork between the public agencies is as important as teamwork among interested lay groups. The watershed association may want to set up a number of committees to handle various phases of the work. A great deal of effort must be expended during this period in informing the general public as to the nature of the problems. Allow plenty of time for organization leaders to discuss the problem with their individual groups. Most leaders will not move very fast on a project of this kind without first gaining support of the organization each represents. Obtaining the survey and putting facts together will be as difficult as the complexity of the proposed project. This phase of the work in a small simple watershed may be done by existing organizations or by the watershed association officers. In more complex situations, a paid staff may be necessary. Assistance with the inventory and planning may be obtained from the Federal government under the *Watershed Protection and Flood Prevention Act* which was passed by the 83rd Congress.

After the facts are compiled the problem of interpretation and possible action becomes the next major undertaking. Here again all members of the association should be assembled and the facts laid clearly and unbiased before them. If possible, various alternatives for action should be presented.

In small, simple watersheds the problems may be solved by individuals, local agencies, or by small member groups. In more complex situations, especially if Federal assistance is requested under the *Watershed Protection and Flood Prevention Act*, a legal body may be required to arrange with governmental units to raise necessary financing and to enter into legal contracts.

If the scope of the operations appears to be beyond the ability of the people in the watershed then the time is ripe for soliciting the assistance of government above the community level.

Acquaint People With Program Details

Organized publicity is a key to success. There is no substitute for an informed public. Every possible means should be utilized to acquaint people with problems, solutions, objectives and costs. *Remember that the average individual usually wants to know two things: First, how will the program affect me and, secondly, how much is it going to cost?*

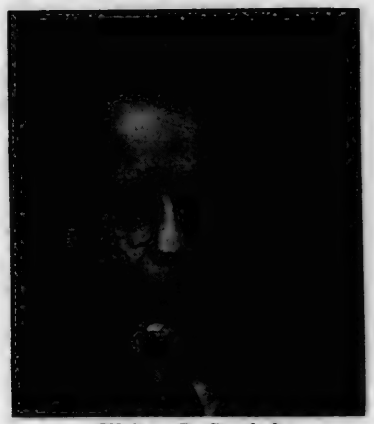
In an undertaking of this kind, continuous publicity must be carried on in order to maintain interest. Successful watershed associations throughout the country all report widespread use of every available means of communication. One of the recent developments in this field is the employment in a few states of assistant county extension agents in soil and water conservation. These agents are materially aiding watershed development. Another state extension service has employed local extension agents in soil conservation to assist specific watersheds.

If local organization details have been carefully and intelligently worked out, it will be "our" watershed. This is essential for a long-time successful watershed program. Some people may believe that this procedure is too slow, requires too much detail, and too much local effort, but upon careful reflection there is no other satisfactory way.

This is the sixth and last article in the JOURNAL'S special series entitled "Protecting and Developing the Nation's Watersheds." It was written by Russell G. Hill, executive secretary of the State Soil Conservation Committee of Michigan and extension specialist in Soil Conservation, Michigan State University, East Lansing.

SCSA Pays Tribute to Walter Gumbel for Society's Journal Editorship

By Edward H. Graham, President
Soil Conservation Society of America



Walter C. Gumbel

IT IS NOT POSSIBLE to let Walter Gumbel's leaving the JOURNAL as its editor pass without writing something in tribute to him—a word of appreciation for what he has done for the JOURNAL OF SOIL AND WATER CONSERVATION and what he has meant to the Soil Conservation Society of America. I do this not only in my role as President of the Society for 1956, but also because of the long and intimate association Walter Gumbel and I have had in the Society and particularly with the JOURNAL itself. As I write this I have before me Volume 1 No. 1 of the JOURNAL OF SOIL AND WATER CONSERVATION. It is dated July, 1946. It was smaller in format than the present JOURNAL, being 7½" x 10" in size. It had a gray cover with brown imprint. It was 52 pages in length, however, and in many ways set the pattern for the JOURNAL in its present style. There was an article by the first president, Ralph H. Musser, with a mingling of technical and semi-technical articles and a pictorial center spread. It included also a book review and other specialized sections. It carried three full pages of advertising. Walter C. Gumbel was listed as editor, as he is in the present issue, the last one for which he will assume editorship.

Journal First Published in 1946

It was my interesting chore to serve in 1946 as chairman of the Publications and Editorial Committee, which included Hal Jenkins, Gordon Zimmerman, Glenn Loyd, Art Emerson, A. E. Jones and Glenn Rule. None of us knew at that time whether the Society could sustain a JOURNAL, or, for that matter, whether the Society itself could survive. The Society was young, with only 14 chapters and 1,700 members. Today the Society is well established and the place of the JOURNAL OF SOIL AND WATER CONSERVATION in both conservation and professional spheres of activity is secure. This has been in very large part due to the work of the editor. I have been close enough to the work that Walter Gumbel has done to know that the Society could never have had the kind of JOURNAL it now supports without the conscientious application to the task at hand and the sincere dedication to the Society which Walter has displayed. He has made the JOURNAL a highly respected professional publication by hard work, ability to adapt himself to changing demands, and a very keen appreciation of what is appropriate for a publication of this nature.

All of this Walter Gumbel has done with his left hand, so to speak. At the very time that he undertook the JOURNAL editorship he was also taking over one of the first soil conservationist jobs in history—with the Monongahela Power Company at Fairmont, West Virginia. Since then he has been very productively engaged in that capacity, and has been effective in many other conservation activities, including Friends of the Land, the Water Resources Committee of the West Virginia Chamber of Commerce, the State Department of Education's Conservation Education Advisory Committee, the Land Committee of the Interstate Commission on the Potomac, and the Northeast Forest Research Advisory Council. He has concerned himself particularly with the development of small watershed organizations and a national land use policy.

When the JOURNAL first appeared it was published as a quarterly. In September, 1952, it became a bi-monthly publication. There are now plans to produce it monthly as soon as proper arrangements can be made. In January, 1948, the format had been enlarged to its present dimensions. Throughout its history such changes have shown the progress of the JOURNAL and the development of the Society.

The place which the Society has earned for itself in the past decade is due in no small part to the JOURNAL. It is for most members the obvious representation of what the Society stands for and what it accomplishes. When, for example, the Society was selected as one of seven out of many hundreds of professional societies to work with the International Cooperation Administration to carry professional soil conservation to technicians in foreign countries who had been to the United States for

training, the JOURNAL was one of the important influences in the decision that was made, along with the fact that the purpose of the Society itself was concerned with meeting a fundamental human need. In many other ways the JOURNAL is having an impact not only at home but abroad.

While this note is in tribute to Walter Gumbel, we should not forget that Helen Gumbel has from the first worked closely with him in the review of manuscripts, editing, proofreading, and make-up which go into the lonely and meticulous job of constructing a publication of this kind. Helen Gumbel has made a contribution to the development of the JOURNAL and to the Society which cannot rightly be separated from that of the man whose name appears as editor on the masthead.

It does not come to many persons to develop a new professional publication, but Walter Gumbel has done this in commendable style. He and Helen, at little financial recompense from the Society, have devoted more time and energy to the JOURNAL than the Society had any right to expect. Because of the ever increasing demands for time and energy at his regular job, however, Walter has felt it necessary after more than a decade of service to the Society to finally relinquish the editorship of the JOURNAL. The Society is now in the process of selecting a full-time editor. In the interim, starting with the September issue, Alvin F. Bull, of the Wallace-Homestead Company, Des Moines, Iowa, has consented to serve as acting editor. We have also prevailed upon Walter Gumbel to continue indefinitely as consulting editor. His experience and judgment will continue to be available to the Society, the Editorial Board, and others who will carry on with the Society's publication.

Thus Walter does not leave the JOURNAL, but steps down as the one who carries the major responsibility for its success. All of us in the Society take this opportunity to thank him for the work he has done, to wish him the very best of success with the other tasks he carries on, and to express our appreciation for the fact that he is willing to continue as consulting editor of the publication that he has almost single-handedly created as one of the nation's foremost professional journals.

Conservation Foundation Holds Training and Employment Conference

With the objective of "*reducing the gap between organizations requiring resource-trained individuals and those institutions prepared to furnish that training,*" the Conservation Foundation of New York sponsored a conference at the University of Michigan, April 27 and 28, 1956. The meeting was attended by 30 persons actively concerned with the subject, either from the standpoint of employment or with training responsibilities. Representatives were invited from business and industry or from educational institutions, with three from government. The conference addressed itself to four primary topics: *The specific needs for resource-trained personnel; means of meeting such needs in business, industry, and government; administrative organization of graduate schools for training such personnel; and objectives of formal resource training at the graduate level.*

The conference was opened by remarks from Fairfield Osborn, president of the Conservation Foundation, who pointed to the necessity of closer relationship between those who trained and those who employed personnel in the relatively new field of resource management. The sessions were under the general guidance of Roger D. Hale of the Foundation, who has had the subject under study for some time and who described it in the March issue of the JOURNAL. Five working groups under the chairmanship of Stanley A. Cain, Paul B. Sears, Vincent S. Madison, Edward H. Graham, and Paul M. Dunn brought suggestions to the full conference which were then summarized by the general chairman, Samuel T. Dana, dean emeritus of the School of Natural Resources of the University of Michigan. The results of the meeting will be published in the autumn by the Conservation Foundation.

Among the results was a realization of the growing need for men with a broad general appreciation and understanding of natural resources and what they mean in the modern world. *This need exists not only in government but in area development work of business and industrial organizations and in community and area planning.* It was recognized also that while graduate training in the general resource field is important and useful, undergraduate training in a specialized field is in most instances desirable as a prerequisite for graduate training and for employment in governmental, industrial, and planning work. The conference disclosed an area of consideration which needs careful attention in the future, not only by those training men as "resource technologists," but by those providing undergraduate as well as graduate training in conservation. The meeting was able to bring together a distinguished and qualified group of persons to give jointly serious consideration to the subject—a first and necessary step toward more orderly development of progress in this important activity.

Vanishing Crop Land

E. A. NORTON

Our country's expanding economy is swallowing up good crop land at an alarming rate. Industrial and suburban developments, rights-of-way for highways and airports, and other improvements have taken over more than one and one-third million acres of our best soil in each of the past five years. An area equal to one-twentieth of all the productive crop land left in the United States has been removed from reach of the plow over the last fifteen years.

THE WITHDRAWAL OF LAND from cultivation is contributing to some extent to solution of the current problem of surplus agricultural commodities. However, not too much of the acreage that has been withdrawn had been producing over-abundant crops like wheat, cotton or corn. Rather, the acreage that has been lost to agricultural production has been growing truck crops and dairy products, which are not now in surplus, but are in heaviest market demand at the very points of greatest urban and industrial development.

It isn't that we will run out of productive land in the next several decades. *Agricultural technology, by making it possible to increase yields per acre, will see to maintaining our immediate needs for food and fiber in the foreseeable future.* But continued loss of good crop land means driving our agriculture more and more onto lands not particularly suited to intensive cropping. The truck growers and dairymen, for example, are being forced to move farther and farther away from their markets and frequently have to turn to less productive land.

Much of the land going into airports, suburban and industrial developments is the flattest, most fertile and least erodible we have. It's the kind of land that has been growing the food that reaches city markets at reasonable prices. It costs more to grow food on poor, infertile land than it does to produce it on our best quality crop land. Not only that, but it's expensive to transport food long distances and maintain its market quality.

Driving farmers and ranchers to produce food and fiber on unproductive, erodible land far from market does not offer a solution to the cost-price squeeze in which they now find themselves. Rather, it complicates the problem. Nor is there little immediate hope for the soil conservationists to influence the industrialists and urbanites to help save good farm land for cultivation.

Highways Require Large Acreages

The new national highway program now about to be launched is estimated to take at least 250,000 acres of land out of agricultural production every year for the next fifteen. This alone is the equivalent of taking 1,500 farms out of agriculture each year. The highways which take the most crop land are those multiple lane thru-ways connecting large cities.

Highways can be built much more cheaply and safely over nearly level terrain where much of our productive land also lies. For similar reasons, planners of industrial and suburban areas seek smooth, gently rolling land for new developments. There is little chance of persuading developers to seek anything but the smoother lands—unless we as a nation become conscious of what it could mean to be dependent upon distant areas—even foregin countries—for part of our essential food supply.

Eventually, the food demands of our population will catch up with what can be produced on all our available farm land under present production methods. It is estimated that this will be during the lifetime of half or more of those of us now living. If both the rate of population increase and the rate of annual disappearance of crop land remain stable, the curve of increased consumption of food would cross that of total food production sometime before the year 2000.

What then? Well, we won't be going without something to eat, because increasing per acre yields, extending cultivation to lower producing lands, and introducing new sources of energy to agriculture will make enough food available. *However, it will likely mean the passing of the age of comparatively cheap food in America. A plentiful supply of good but inexpensive food has contributed much to the rapid development of our nation as a world leader.* This secret of national success has just been discovered by the Russians, who are now turning so much of their collective energy towards food production.

Flood Hazards Are Increased

Problems in soil and water conservation other than that of decreased food and fiber supply result from converting farm lands to rights-of-way, suburban and industrial developments. One is damage from flooding in agricultural areas affected by changing the use of the land.

Many areas developed for suburban or industrial use now have accelerated run-off and sediment accumulation. In fact, the hydrology of these areas may be modified so much as to present a serious problem where none previously existed. Putting as much as 15 to 25 per cent of

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Figure 1. Multiple three-lane highways take 60 acres of land for each mile out of production.

the total area under roof and pavement, along with providing a storm drainage system, frequently taxes downstream capacities to carry away flood flows without damage.

Suburban and industrial developments do not spread out from urban centers uniformly. One-half to two-thirds of the land generally remains unoccupied; and it soon becomes impracticable to farm it. The problem frequently is one of taxes. Schools, streets, water supplies, sewage disposal and other improvements are made, and the remaining farm land must stand its share of the cost. The affected farmers find they just can't pay city land taxes out of regular farm income, and sooner or later dispose of their land to those who speculate in its future value for non-agricultural use.

Such a change in land ownership does not solve the conservation problems, but places the land in a position so that it is difficult to get anything done on it. *Some of our most pressing flood, drainage, and erosion problems occur in these areas of rapidly expanding suburban developments.* The supervisors of soil conservation districts, in most places, have not considered suburban areas their responsibility. Yet the problems of these areas are a growing challenge to them and to all soil conservationists.

As previously stated, most of the arable land converted to other uses lies adjacent to cities and towns with rapidly expanding population. This is true except for some areas, such as the southern states that line the Gulf of Mexico, notably Texas, Louisiana, Georgia and Florida. In these states large acreages of cultivated crop lands have been planted to trees—sometimes the more desirable use from the conservation standpoint as well as the most economical use of such lands.

Massachusetts, Connecticut, Rhode Island, New York, New Jersey and Pennsylvania are the eastern states where large acreages of crop land is being diverted from agricultural use annually. Ohio, Michigan, Indiana and Illinois are the principal midwestern states losing agricultural land to other uses. California is the lone western state where large acreages of good arable land now are being converted to other uses. Arable land in Oklahoma, Arkansas, Mississippi, Alabama and South Carolina is disappearing at a moderately fast rate. The loss of farm lands to other uses in most of the other states has not yet reached the critical stage.

Planning to Protect Agricultural Land

A few planners and conservationists have dealt directly with the problem. Santa Clara County in California, for example, has an ordinance to keep industry and suburban developments from moving in on its highly productive pear orchards. The Agricultural Extension Service in that state has a project on agricultural land encroachment. West Coast urban newspapers are giving the subject of agricultural zoning considerable publicity.

Not to be outdone, Florida has awakened to planning for protection of agricultural lands. But, otherwise, this field is mostly virgin, and policies that will make it possible for our economy to expand without unnecessary enroachment on productive crop lands need to be developed.

Farmers and ranchers, through their more than 2,700 soil conservation districts, are rapidly closing the gap on the loss productive farm land by destructive soil erosion and depletion. Community projects for flood prevention in small watersheds are getting underway throughout the country. The problem of preventing avoidable conversion of cultivable land to other uses is awaiting a practicable solution. The answer lies, in large measure, in local understanding of the problem, a desire to do something about it, and the initiative of state governments and affected individuals and communities in making use of the soil conservation district and other conservation facilities that are available.

Recent Developments and Observations in Soil and Water Conservation Research

Accomplishments of the Abandoned SCS Nursery at Brooksville, Florida

By C. B. Blickensderfer

The Soil Conservation Service Nursery at Brooksville, Florida, in cooperation with the soil conservation districts of Florida, gave great impetus to the rapid development of improved pastures and the use of soil building crops in groves and on farm land throughout the state. This nursery was in operation from July, 1945, until June 30, 1954, when it was abandoned.

Seeds, plants and plant materials were distributed to district cooperators with the understanding that this material be further increased to become available to the trade. In this way new varieties or strains of forage plants were rapidly increased.

Take, for instance, the case of Hairy Indigo. This plant was first grown at the University of Florida Experiment Station in Gainesville by George E. Ritchie, then of the Bureau of Plant Industry, United States Department of Agriculture. In the early 1930's, Ritchie discovered a small plant of Indigo growing in a coal pile. The plant intrigued him to the point that he tried it under a variety of conditions. David Ventulett, now area conservationist at Ocala, Florida, was, at that time, stationed in Gainesville. He, too, became interested in the plant and Mr. Ritchie gave him some seed. Ventulett gave the seed to the Land Use Project at Brooksville where it was planted on an old forest tree nursery site. Here it produced seed and a few were given to the work unit conservationist at Brooksville for distribution to one or two district cooperators. The remaining seed was given to a citrus grower south of Haines City in Polk County. The cooperator planted it in a young grove. In the fall of 1944, the author, with three other Soil Conservation Service employees, was sent to this grove where we spent two weeks gathering ripe Indigo seed by hand. The seed was cleaned and planted in June of 1945 on the land owned by the Soil Conservation Service at Brooksville and which later became known as the Brooksville Nursery. That year, 4500 pounds of Hairy Indigo seed were harvested at Brooksville. These seed were distributed to soil conservation districts who gave the seed to cooperators. These cooperators harvested seed which they sold to others. At the rate of seeding of five pounds per acre and harvesting from 100 to 500 pounds of seed per acre, it can be readily seen that this plant became widely used throughout the state. Hairy Indigo is especially adapted to the drier, sandier soils of Peninsular Florida.

During the seven years when the Nursery was growing Hairy Indigo seed, a total of 19,740 pounds of the seed were released to soil conservation districts.

An early variety of Hairy Indigo was also introduced by the State Experiment Station at Gainesville and of this strain, from 1946 to 1953, the early Indigo seed produced and released to soil conservation districts was 22,899 pounds. This was in addition to the 19,740 pounds of the late Hairy Indigo seed.

Roots, Stems and Runners Are Grown

In addition to the production of seeds, other propagating materials, such as roots, stems and runners, were grown at the nursery. Use of such materials is the

Figure 1. *Top*: This tractor and combine, owned by the DeSota Soil Conservation District, is harvesting Pensacola Bahia seed—yielding approximately 150 pounds per acre. *Bottom*: Workers are piling up Pangola grass stolons. The stolons are loaded in a truck and transported to a shady area where they are wet down and kept moist until picked up by cooperators for pasture planting.

sole method by which some plants can be grown. It may afford the easiest way of increasing a plant.

Soon after the Florida Experiment Station released Pangola grass to the farmers, the Brooksville Nursery obtained a supply and maintained a four-acre nursery plot for use in growing material for distribution to the soil conservation districts. Although it is difficult to determine the extent to which this plot can be credited with the use of Pangola grass pastures in Florida, it is considerable.

The planting stock from this plot is credited with supplying much of the material from which a large part of the Pangola pastures of South Florida originated. A conservative estimate of these pastures puts the acreage at over 400,000. Pangola grass planting material given to soil conservation districts was sufficient to plant 12,543 acres in increase plots.

Coastal Bermuda was also grown and supplied to soil conservation districts. Enough of this material was given to establish 16,211 acres of increase. However, due to the fact that Coastal, during that time, never did become too popular, its spread has been rather limited and the acreage much less than that of Pangola.

The table below gives the quantities of propagating material grown at Brooksville and given to soil conservation districts during the years 1945 through 1953:

Aeschynomene	1,653 lbs.
Bermuda, Coastal	48,634 bu.
Bermuda, Suwanee	2,974 bu.
Crotolaria lanceolata	11,070 lbs.
Indigofera, Early	22,899 lbs.
Indigofera, Ordinary	19,740 lbs.
Indigofera, blanket	4,907 lbs.
Lupine, Sweet Yellow (*White-seeded*)	42,390 lbs.
Pangola grass	37,640 bu.
Pensacola Bahia	22,660 lbs.
Argentine Bahia	12,418 lbs.

The above listed items are only the plants of major importance.

From an economical point of view, during the time the Brooksville Nursery was in existence, it produced sufficient seed and planting material to more than pay its way. In computing this point, only marketable materials and the current prices were used. All appropriations rereceived from the Federal Government for all expenditures were more than covered if the materials had been sold rather than granted to the soil conservation districts.

Besides growing planting materials, the nursery provided on-site assistance to soil conservation districts where planting problems appeared as well as working out methods of seed production and harvesting. Observational studies of hundreds of plants were made in a program where new plants were grown and evaluated. New methods of managing the plants to obtain best conservation uses were observed.

C. B. Blickensderfer, a member of the SCSA, is plant materials specialist for the Soil Conservation Service. His headquarters are in Sarasota, Florida.

Pastry Wheat Quality and Yield Improved by Nitrogen

By Albert S. Hunter, Cleveland J. Gerard, and H. Marr Waddoups

The use of stubble-mulch tillage to lessen soil erosion in the Columbia Basin dryland summer-fallow area of Oregon has been recommended for several years and is increasing. It has been found that, in comparison with clean tillage, yield depressions sometimes result from stubble-mulching, and that nitrogenous fertilizer may be used to overcome this depression. The use of nitrogenous fertilizer to increase the yields of wheat under all conditions of tillage has become fairly general over the area since 1949.

Along with increasing the yields of grain, nitrogenous fertilizers commonly also increase the yield of straw, thereby resulting in greater amounts of residues to protect and improve the soil. Furthermore, in this area where the wheat crop ordinarily exhausts the available moisture from the soil profile and moisture is the first limiting factor in wheat production, nitrogenous fertilizer increases the efficiency of water use by the growing crop. This results in the production of more bushels of wheat per acre from a given amount of available moisture.

The data from a large number of experiments on soft white wheats in the Columbia Basin counties of Oregon show that nitrogenous fertilizers may be used not only to increase the yields, but also to improve the quality of the wheat. The wheats grown in this area present a somewhat unusual problem in the use of nitrogen. Their quality may be impaired if their protein content becomes too high.

It is commonly thought by the public that the quality of wheat is improved by increasing its protein content. For bread wheats this is true. High-protein bread wheats have often commanded premium prices on the market. Increasing protein does not, however, improve the quality of all wheats. The soft white wheats that comprise the great bulk of the wheat crop in the Columbia Basin are used chiefly for pastries. The pastry trade prefers soft white wheat with a protein content of from 8 to 10 per cent and the quality is impaired if the content of protein is much below or above this range. Pastry types of wheat are not suitable for breads even when their protein contents are as high as those of good bread wheats.

Yield Response to Nitrogen Fertilizers Varied

In 1953-4 experiments were conducted on 48 farms in the Columbia Basin counties of Central Northern Oregon, for the purpose of determining the effects of nitrogenous fertilizers on the yield and quality of wheat.

On all but four farms winter wheat was grown after summer fallow. On three farms winter wheat followed green peas; on one farm winter wheat followed winter wheat. Rates of nitrogen (ammonium nitrate) varied by 20-pound increments from none to 80 pounds per acre in the lower rainfall areas and by 30-pound increments from none to 120 pounds per acre in the areas of higher rainfall. To some plots applications of nitrogen were made at these rates in the fall, just prior to seeding; to others it was applied early in the spring, to the growing wheat. Other treatments involved combinations of 40 (or 60) pounds of nitrogen, 50 pounds phosphoric acid (P_2O_5), and 50 pounds sulfur per acre. The experiments were carried out under farm conditions, with the farmers performing all operations except application of fertilizers and harvest of wheat from plots.

The optimum rate of nitrogen for maximum yield response varied from farm to farm. Presumably, differences in responses were related to the amounts of moisture and nitrogen available in the soil. (An intensive study of the soil moisture-nitrogen-fertilizer response relationship is in progress.)

Wheat yields were increased by fall-applied nitrogen on 36 and by spring-applied nitrogen on 42 of the 48 farms. On 15 farms fall was superior to spring application, on 12 farms the reverse was true, and on 21 farms no yield differences could be attributed to time of application. In cases where yields were depressed by nitrogen, the depression from spring applications was usually less than those resulting from fall applications. There appeared to be no need for phosphorus. A response to sulfur was observed on one farm, under re-cropping conditions.

Protein Content Depends on Nitrogen

When protein levels in the grain were compared with yield responses to applied nitrogen it was apparent that while increasing rates of nitrogen were increasing yields, the protein content of the wheat was not increased to objectionably high values, above 10 per cent. It was only when more nitrogen was applied than was necessary to produce maximum yield that protein was increased to undesirably high levels.

Without application of nitrogen the protein content of the wheat was below the desirable range on 21 of the 36 farms where nitrogen was needed to increase yields. On these 21 farms it was necessary to apply nitrogen in order to increase the protein content to a level satisfactory to the trade.

The following table summarizes the data on average yield and protein content for each county. Because of wide variations in responses within any given county, fertilizer recommendations for the county may not be made on the basis of the average responses presented. The data are set forth to show that protein contents are sometimes too low where no nitrogen is applied and do not rise to objectionably high levels if no more nitrogen is applied than is required to produce maximum or near-maximum yields. This conclusion has been confirmed by statistical analysis of the data on yield and protein content responses to nitrogenous fertilizer on all the farms.

Nitrogen Applied, lbs/A.	Umatilla Co. (15 farms)[1]		Morrow Co. (9 farms)		Gilliam Co. (7 farms)		Sherman Co. (10 farms)		Wasco Co. (7 farms)	
	Yield bu/A.	Protein %	Yield bu/A.	Protein %	Yield bu/A.	Protein %	Yield bu/A.	Protein %	Yield bu/A.	Protein %
0	22	7.7	26	7.9	27	8.1	31	6.2	19	7.0
20	26	8.6	28	8.8	29	8.3	38	6.4	25	7.3
40	30	9.5	28	10.7	31	9.2	44	7.3	29	8.1
60	31	10.8	28	12.3	30	10.0	45	8.2	31	9.2
80	31	11.6	26	13.3	31	10.8	47	8.8	33	10.4

Albert S. Hunter and Cleveland J. Gerard are soil scientists employed jointly by the Oregon Agricultural Experiment Station and the Soil and Water Conservation Research Branch, Agricultural Research Service, USDA. H. Marr Waddoups was formerly an agronomist with the Oregon Agricultural Experiment Station. *The results reported are the first year's findings of a cooperative investigation on the fertilizer requirements of wheat in Central northern Oregon. H. E. Cushman, W. E. Hall, M. M. Oveson, Extension Agents V. W. Johnson, N. C. Anderson, Dell Purnell, T. W. Thompson, and E. M. Nelson actively participated in the investigations. Protein analyses were in charge of L. A. Alban.*

Floods and Landslides in Japan During 1954

By Bernard Frank

During the summer and fall of 1954 torrential rains *(typhoons)* fell on parts of Japan causing severe and in many cases record-breaking peak discharges. Several of these floods, especially in the mountainous headwaters, were accompanied by landslides which greatly magnified the damages.

Studies of the causes and nature of these floods were made in three separate localities by Japanese technicians, who also recommended means of curbing further such occurrences or for avoiding their effects. Their reports appear in an illustrated Japanese language booklet of 139 pages, with English résumés, entitled *A Study of 1954 Flood*, No. 84, February 1956. An abstract of each study follows:

Shikoku District. Total rainfall from September 12-14 on the Monobe River headwaters was over 40 inches, of which 25 inches fell in 24 hours. The resulting peak discharge amounted to 2800 cubic feet per second per square mile (csm) in the upper reaches, and 450 csm in the lower reaches with a drainage area of 115 square miles.

Analyses of flow durations and rates and rainfall dis-

tribution at a downstream station with a 131 square mile catchment area show that increased flows lasted 100 hours and that the peak of 10,600 cfs occurred 31 hours after the storm began. The ratio of increased flow to precipitation from the beginning to the peak amounted to 37 per cent, and rose to 80 per cent from the occurrence of the peak to the end of increased flow. The maximum hourly discharge throughout the entire period was 1.2 inches or 50 per cent of the rainfall.

The author concludes that the Monobe River had higher unit discharges than those from other rivers of similar characteristics.

Landslide areas and occurrences varied from relatively slight and infrequent to extensive and frequent depending upon topographic and geologic features and the condition of the forest cover. Aside from stable bed rock conditions in the Monobe headwaters, forest cover is credited with resisting landslide formation and the enlargement of such slides as did occur, and in trapping falling rock.

Protective recommendations include both engineering works and conservative forest management. Slope stabilization measures call for fixation of unstable debris in slide areas, drainage of landcreep areas, prohibition of logging practices that denude the soil, and dense plantings of locally adapted tree and shrub species with strong, wide spreading root systems, fortified with oil and manure as required. Stream control involves the construction of low dams, revetments, or spurs to prevent side slope undercutting, and check dams to reduce velocities of waters heavily burdened with sand and stone. *Finally, in planning control measures the influence of every unstable section upon the entire basin must be considered.*

Kyushu District. Storm precipitation and peak discharges from the typhoon and antecedent rainfall were only slightly less in magnitude than those in the Shikoku District, and slides and channel ripping correspondingly severe. The retarding effects of forest cover were not apparent in this district, as the slides usually occurred on talus slopes below cliffs and along streams, and the existing forest growth was of recent origin. However, the authors state that most of the slides were due to discontinuities of the ground cover or the condition of the forest and that, above all, "the influence of forest roads upon slides can not be neglected."

In addition to prescribing physical remedial measures, the authors strongly advise against indiscriminate human occupance of small alluvial fans or stream bottoms. Instead, they recommend the establishment of appropriate forest cover in these locations.

Yamanashi and Shizuoka Districts. Two types of slides and landcreep, respectively, resulted from the typhoon rains in the basin of the Fuji River. The slides on the slopes of the foothills were caused by surface runoff and quick seepage, and those along streams by flood flows. The landcreeps occurred in the zone between the foothills and mountains, and along both sides of each ridge. Both types of disturbance are closely associated with the occurrence of highly faulted and fractured bedrock and numerous springs and seeps on the slopes. Recommended controls include the diversion of ground waters at their source from landcreep areas, quick application of brush or other mulches on bared slides, and concentration of drainage waters into stable or stabilized natural channels. Channel and streamside slide control involves the construction of low check dams to provide support for the toes of side slopes, debris clearing and other channel improvements, and the planting of deep-rooted trees.

Unlike the Fuji River basin, the mountainous Abe and Oi basins are intensively utilized and heavily populated. Consequently, despite the relatively small ratio of landslide area to watershed area, many homes were crushed and lives lost. *Among other recommendations (similar to those mentioned above) the investigators stress the avoidance of forms of land use which will cause the filling of flood-retarding basins with debris and the reduction of channel capacities.*

Bernard Frank, a member of the JOURNAL *Editorial Board, is in the Division of Forest Influences, United States Forest Service, Washington, D. C.*

Hydraulic Engineer Develops A New Low-Cost Spillway

A simplified hooded-pipe spillway that can save hundreds of thousands of dollars a year in dam and reservoir construction costs has been developed by F. W. Blaisdell, a United States Department of Agriculture hydraulics research engineer.

The modified spillway—cheaper to build than conventional types—is suited for handling the overflow from the thousands of farm and ranch ponds built in the United States each year, as well as from the larger detention reservoirs used in watershed protection and flood control.

This low cost, full-flowing spillway pipe was achieved simply by cutting the opening of the intake pipe, on the reservoir side of the dam, at an angle to give the pipe a hooded effect. The hooded spillway pipe angles downward through the dam, and its outlet feeds into a stream or other depository beyond the dam face.

Prior to the development of the hooded-pipe spillway, full flow was achieved only with a rather complicated pipe installation. In small dams such installations often represented a major part of the cost of dam construction. A conventional spillway of this type consists of a large diameter vertical pipe on the reservoir side of the dam that is securely footed upon the base of the dam or upon

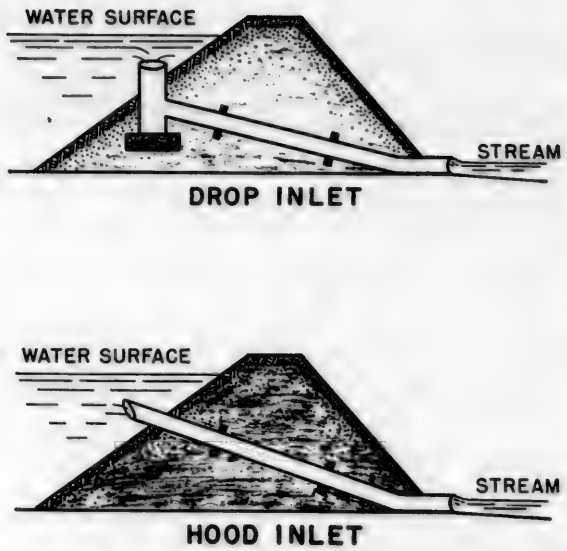

Figure 1. This drawing shows the difference between the hooded-pipe spillway and a conventional vertical-intake spillway.

a specially-built concrete base within the dam structure. Attached at a sharp angle to this vertical intake pipe is the full-flowing outlet pipe that carries water from the intake pipe for discharge beyond the dam. To obtain full flow, the outlet pipe must be smaller in diameter than the intake pipe. For comparable dams, a hooded spillway pipe can be about the same size for its full length as the outlet-pipe portion of a vertical-intake spillway.

The hooded spillway pipe was developed by Mr. Blaisdell, of the Agricultural Research Service, at its St. Anthony Falls, Minnesota, hydraulics laboratory. Blaisdell conceived the idea for the hooded spillway from an Oregon State College development of full-flowing pipes to carry maximum water flow under road culverts and railroad trestles.

Blaisdell's research has shown that the simplified spillway pipe will flow full with a minimum of water pressure if the hood, the top edge of the intake pipe, projects over the bottom edge of the pipe by a distance equal to or greater than three-fourths of the spillway-pipe diameter.

Water Yield and Public Land Management

(Continued from page 161)

game, recreational values, soil stability, flood prevention, and quality of water, all of which affect many other people directly or indirectly?

The problem of the effect of grazing low vegetation on total annual water yield needs further careful study. We know from experience and research however, that there is no compromising with the laws of nature—either we maintain an adequate vegetal cover on forest and range lands or we lose our soil.

Personalized Soil Management Guides

(Continued from page 173)

publicity because it seems desirable to keep the number of new cooperators each year within limits to which the county agent and Soil Conservation Service technicians can give personal attention. However, community publicity and the group approach may be used to stimulate interest in parts of a county. Even though the number of management guides issued annually in a county may be limited, it is believed that greater and more effective use will be made of the soils information if the farmer receives personal help and advice with the soil management guide for his farm.

No charge is made for the soil management guides used in Illinois at the present time. However, studies in Livingston and Iroquois Counties, Illinois, indicate that many farmers are willing to pay for a detailed soil map and accompanying information on soil characteristics and management, as they are now paying for soil tests.

The soil management guides being used in Illinois are a cooperative project among the Illinois Agricultural Experiment Station, Extension Service, Soil Conservation Service, soil conservation district, and county farm bureau. The Illinois Agricultural Experiment Station and Soil Conservation Service make the soil surveys; Soil Conservation Service furnishes reproductions of the detailed soil maps on aerial photographic base; the Extension Service prints the soil management guides; and the information is distributed through the local county agent and work unit conservationist in cooperation with their respective boards of directors.

The chief harvest of the land is man himself. From the soil comes the quality of his bone and muscle. What he is, what he does, and how he does it are determined by the acres he tills. His courage, his ambition his very way of thinking grow out of the furrows at his feet as truly as the wheat, the cotton and the clover he tends.

—WELLINGTON BRINK, *From Soil Conservation Magazine*

SOIL CONSERVATION. By Sellers G. Archer. *The University of Oklahoma Press, Norman, Oklahoma. 305 pages, illustrated with 14 figures, five tables and 30 pages of photographs. $3.75. 1956.*

The author of this very fine book believes everyone is a conservationist of one kind or another—either good or bad. It is for this reason that *Soil Conservation* highlights the critical problems of the soil thereby making it possible for everyone to become a good conservationist.

An unusual feature of the book is the contents section. Each section outlines the principal items covered—thereby giving the reader at first glance a complete picture of what the book contains. *The Field of Conservation* is detailed in the first section. Other sections feature *Planning for Conservation, Cropland Treatment, Grassland Agriculture, Farm Forestry, Nature's Acres,* or *Wildlife on the Farm; Special Programs* in *Conservation and Public Assistance in Conservation.*

Sellers Archer knows conservation and what it takes to get the job done. He is close to the land and the people. The style of his writing is simple and direct. His views are stated in terms that can easily be understood. Each photograph also tells its own story as do the numerous charts and tables.

Soil Conservation is a guide to practical conservation. It also contains excellent up-to-date information on how to get maximum assistance from agencies offering educational, technical and financial help. The book should have great appeal to farmers and ranchers, to businessmen, educators and conservationists.

THE RANGE AND PASTURE BOOK. By Roy L. Donahue, Everett F. Evans and L. I. Jones. *Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1956, 406 pp., $4.20.*

This unusually well-illustrated book was written for use in schools as a basic text for Vo-Ag, general agriculture, and Veterans' training courses and for reference use with other courses. It should be effective for these uses. Many farmers and ranchers would undoubtedly value it for the specific information on results of experimental work with grasses and their uses in farming operations. It would serve as a good book for review by home demonstration clubs which wish to learn more about grasslands in modern agriculture.

Naturally, I read the chapter on *"How Grasses Conserve Soil and Water"* with special interest. The authors show clearly how vegetation protects soil because it "gives with the punch," absorbing the energy of the falling raindrops. The principles of watershed management are well stated and are of particular importance at this time of greatly increased interest in small watershed programs. The mechanization of grassland farming as portrayed is impressive.

One could cite many other important and interesting aspects of grassland farming which are described in this book. It is good reading for most agricultural workers. Put it on your list.

—W. R. Tascher, *Washington, D. C.*

CONSERVING SOIL. By M. D. Butler. *D. Van Nostrand Company, Inc., Princeton, New Jersey. 321 pages, illustrated. 1955.*

Conserving Soil was designed as a text to be used by agriculture teachers. However, it has a place as reference on any high school or college teacher's list who is covering the conservation field. The title is misleading in that it might just have well have been *Conserving Our Natural Resources.*

The three chapters in Unit One set the stage by defining what conserving soil means, how settlement affects soil and factors to consider in managing soil. Unit Two has four chapters including one each on: Soil, Water, Organic Matter and Plant Nutrients in the Soil. The middle unit on Jobs that Improve the Land has four chapters that should please "doers." Jobs are broken down as to season and weather. Projects for controlling wind erosion and stream bank—both large and small—are also a part of this unit. Unit Four entitled Conservation Tools has a chapter devoted to Grasses and Legumes and a long one on Trees.

The fifth and last unit contains ten chapters on describing Watersheds and their problems in different sections of the United States.

Throughout the book are many pictures, several diagrams and maps, plus some interesting graphs and tables in the appendix. After each chapter are many thought-provoking questions and suggestions of practical projects that an FFA Chapter, 4-H Club or for that matter a Grange or Garden Club or other adult group might try.

This is a book that the professional conservationist might well suggest to the serious minded layman for reading. It contains many practical conservation suggestions, including the development of an integrated program for a local watershed. The list of references at the close of each chapter will permit an interested person to pursue many of the subjects further.

As in any book of a technical nature there are some statements or figures that can be challenged by the expert in particular subjects under discussions. For my part I will say, let he who will write a better book do so and in the meantime say thanks to author Butler for providing another tool for the teacher or club conservation chairman looking for a conservation guide book.

—HOWARD MENDENHALL, *New Philadelphia, Ohio*

TOMORROW'S BIRTHRIGHT. BY BARROW LYONS. *Funk and Wagnalls, 153 East 24th Street, New York 10, New York, 407 pages, 1956. $5.*

This book does not contribute a great deal that will be new to the informed conservationist. But it will be interesting to the lay reader in that it gives a very readable account of the origin of such conservation programs as we now have. The numerous frustrating obstacles these have encountered are also well described. To the reader, seeking light on the present situation of our renewable natural resources, two of the most interesting chapters are *The Ever-Renewable Forest* and *Water, A Limiting Resource.* In the first Lyons brings out the rapidly increasing demands for timber products due to progress in the field of wood chemistry, and the difficulties in the way of getting sustained-yield practices in general use. This is particularly true of the smaller timber growers among which, as the recent *Timber Resources Review* showed, good management practices are at the lowest point. Lyons offers four different approaches to the forest problem. In one he suggests that the great diversity of products that can now be manufactured from wood as a raw material, thereby increasing its capacity to yield profits, may become the basis for a more economical management of forests and so provide a solution. Nearly one-half of the book is involved with water and its complex of problems. The tremendous increase in the uses of water, the heavy drain on our groundwater resources, the tardy progress of pollution control and the domination of water programs by the Corps of Army Engineers are all well told. The opportunities—economic, social and recreational—that would accrue from the proper management and use of our water resources are indicated, if not fully stated. But the advantages of the watershed as the practical unit for the development of multi-purpose resource programs are not adequately recognized. Instead Lyons leans toward programs of large scale basin development, though noting the difficulties that stand in their way.

It is in dealing with water, particularly in its relation to power development, that Lyons aggressively enters the realm of controversy. He is an advocate of public power, and an able one. Some of the chapters, especially those concerning Hell's Canyon and the Central Valley project in California, are strongly persuasive and are backed up with considerably documentary evidence. But Pilate's ever-recurrent question "What is truth?" was never more pertinent than when applied to this issue of public versus private power development. Lyons' discussion can well be read by those interested in the subject. But it should be counter-balanced by the equally potent arguments on the other side. The reader should be warned, however, to take such brainwashing terms as "socialistic," "reactionary" and "monopolistic," which characterize the arguments on both sides, with ample grains of mental salt.

In one respect the book is open to criticism in this reviewer's judgment. This is the weight of blame he puts on private interests of various kinds for the misuse of our natural resources and the lack of any comprehensive policy that would insure their continued adequacy. The major blame belongs elsewhere—with those who have directed the affairs of government. Their failure to develop any clear-cut policy, their willingness to sacrifice future needs to immediate political expediences and the confusion they have created by scores of piecemeal actions are the chief reasons for the present state of our natural resources and the outlook for the future being what they are. This is nothing new to the student of American history. It happened before with the settlement and disposal of the public domain.

—E. H. TAYLOR, *Swarthmore, Pennsylvania*

JAPAN—LAND AND MEN. BY LAURENCE I. HEWES, JR. *The Iowa State College Press, Ames, Iowa. $4.00. 154 pp. Illustrated. 1956.*

This is a highly enlightening and readable book. Dr. Hewes spent two and one-half years in Japan during the military occupation working with the land reform program. His experience and contacts enable him to portray in a down-to-earth manner the various factors involved in the land reform, that is, the history of Japanese peasantry, the Japanese rural village, the wartime problems, the immediate postwar problems, and the multitude of "stumbling blocks" to be overcome in designing and successfully carrying out the Japanese land reform program.

This book is well written and extremely interesting. It presents a significant achievement in our foreign policy and illustrates how democracy can be promoted in a foreign country through land reform.

The author points out that at the war's end, nearly half of the Japanese lived in farm households. More than four million farm families cultivated land, wholly or in part, they did not own. Forty-six per cent of the farmland was tenant operated. Rents amounted to more than 50 per cent of the crops produced. Taxes and usury had the tenants shackled. As a result of the land reform

program, by January 1, 1949, only 12 per cent of the farmland was tenant operated and 88 per cent was owner operated.

Dr. Hewes carefully explains how, for centuries, the Japanese people have been instruments of Imperial policy and, ruled over by landlords and a caste system, have been told what to do. The Japanese farmers have made great gains from the land transfers initiated under the land reform program. Often the gains made were, partly at least, at the expense of the landlords. But the author indicates that the net social gain was far greater than the cost.

This case study in public administration and political science is a vivid, moving story that should be of particular interest to those who are concerned with the use of agricultural resources. All those interested in American democratic objectives in foreign assistance programs will get a better understanding of some of the deep-seated problems involved in working with Asiatic countries.

—E. L. SAUER, *Champaign, Illinois*

HOW TO FISH FROM TOP TO BOTTOM. BY SID W. GORDON, *The Stackpole Company, Telegraph Press Building, Harrisburg, Pennsylvania. 384 pp. $5.00*

The author presents, in a highly interesting manner, his key to *"What's What in Fishing," which is "learn to read the water."* He points out that plants in lakes and streams are like words in a book. To the author, the study of and attention to water is first, behavior of fish second, and tackle third in successful fishing. This reviewer's limited fishing experience is in hearty agreement with Sid Gordon's admonition *"Stay with a lake or stream long enough to get acquainted with it."*

Gordon's book consists of 23 chapters, covering the sport fishing field from *Water Can Be Read Like a Book, Transparency Is a Guide to Daytime Angling,* to *Lake Improvement Is a Modern Necessity.* The first six chapters deal largely with the study of water in fishing. Chapter seven is on *The Food Shelf Tells You Which Lure to Use,* while chapter eight is on *Drainage and Seepage Lakes Differ.* Chapters nine through 12 are on nymphs, dry, and wet flies. Characteristics of and how to catch trout, bass, muskies, pike and pan fish are covered in the next five chapters. Choosing and how to use tackle is covered in three chapters, followed by chapters on fly typing, and improving fishing.

The book is well lillustrated with 126 figures. The author's explanations (along with the illustrations) of how to make simple tests of the water are clear and should help even the novice become more proficient. This amateur was impressed with the many helpful techniques presented in this book. Mr. Gordon is a highly respected piscatorial technologist. Men, women, and children interested in the sport of angling should find this book helpful in improving their techniques and rewarding in the personal satisfaction that comes from larger catches.

—E. L. SAUER, *Champaign, Illinois*

LURES, *The Guide to Sport Fishing.* BY KEITH C. SCHUYLER, *The Stackpole Company, Telegraph Press Building, Harrisburg, Pennsylvania. 276 pp., illustrated. 1955. $5.00*

The author of *Lures* combines a scientific classification of that glittering array of hooks, hair, paint, and metal that adorns our tackle boxes with a lively and enlightening discussion of when and how to use these artificial tempters to catch more fish. Schuyler loves fishing as a sport and he has the ability to impart his boundless enthusiasm to the reader as he sorts through the tackle box for the next plug or fly.

This book contains 15 chapters divided into four parts, the first of which sets the stage for the following logical and systematic yet exciting approach to the use of fishing lures. Fisherman's luck is figured as 99 per cent skill and one per cent luck. The second section is devoted to a chapter each on dry flies, bugs, and surface plugs. Flies, spinners, spoons, and plugs that are fished under water are covered in the third section while the final part of the book tackles the *Lacy Ways and the Lonely Lures,* or a conglomeration of trolling, jiggling, and methods of fooling fish that nearly defy description.

The reader is not left with a dry cataloging of fishing lures. He is taken to lake and stream and skillfully made a part of the enjoyable process of learning how to use the assortment in his tackle box. A most valuable characteristic of this book is the use of trade names for all lures and equipment. Even the expert should get some useful tips to make those limited days in the field more successful.

—R. N. VAN ARSDALL, *Urbana, Illinois*

PROSPERITY BEYOND TOMORROW. BY SAMUEL H. ORDWAY, JR. *Ronald Press Co., New York. 208 pp. 1955. $3.00.*

In *Prosperity Beyond Tomorrow,* Samuel Ordway expands on the theory advanced in his earlier book, *Resources and the American Dream*[1] that the future of our way of life depends upon our ability to reshape our overweening emphasis on materialistic satisfactions. This book develops the thesis that the greatly increased leisure afforded by technology, by permitting individuals to achieve their potentials for self-improvement, self-discipline, and constructive social service, will thereby strengthen our ability to meet tomorrow's problems.

Many Americans today, feverishly gratifying their desires for immediate material goods, are allowing their

opportunities for enriching mind and spirit to pass heedlessly by. At the same time, our explosive population growth and rising per capita consumption are widening the gap between the renewal of capital resources and the rates at which we are wasting or otherwise using them up. We tolerate conservation so long as it does not interfere with maximum immediate profits, even at the expense of soil and community. Proposals to restrain destructive practices are frowned upon as interfering with the rights of private enterprise. While some groups struggle to preserve park, wilderness, wetland and other inspirational or wildlife areas, others are busily pushing dams, drainage, mining or similar projects which would destroy or seriously depreciate these limited and sensitive resources. Advocates of recreational area "improvements" too often visualize artificial facilities, highly commercial in character, that discount contacts with nature and self-developing activity. Our apathetic indifferences to the quality and breadth of education provided our children, as indicated by our unwillingness to tax ourselves to obtain teachers better able to prepare them for life's complex demands is another disquieting trait of our times.

Ordway's penetrating observations on these and other symptoms of maladjusted living do not dismay him. On the contrary, he sees in well-defined trends a great challenge to start preparing ourselves for tomorrow's problems. He founds his hope on four basic assumptions: (1) freedom from major wars, (2) rising incomes, (3) greatly increased leisure-time through the rapid application of electronic devices (automation), (4) use of capital resources in balance with replenishment.

The commonly-held naive faith that science will always show us an easy, painless way out does not impress the author. Cure-alls somehow fail to materialize; panaceas are forever slipping around the corner; each new technological improvement only adds to the drain on resources. Not too far hence we will need to adjust to less opulent living. We had best prepare ourselves now for such an eventually if we are to forestall the social demoralization that otherwise impends.

How are these adjustments to be achieved? The clue to this question lies in how we use the increased leisure that automation is fast providing. One hundred years ago, the average work week was about 66 hours; by 1920, it fell to about 46 hours; and by 1950 to 39 hours. And automation promises to reduce it soon to some 24 hours. The prescription calls for widespread participation in individual and group pursuits: outdoor recreation; cultivation of the arts and sciences; the study of philosophy, literature, history; soil and water management; community improvement; nature study . . . as the individual sees fit to select from a cornucopia of choices. These leisure-time outlets will provide rich opportunities for each of us to develop our maximum intelligence, skills, talents—all those potentials realizable by men and women freed from excessive work pressures, and from want, fear, greed, and prejudice. The self-confidence, understanding and broadened outlooks thus developed should foster an appreciation of our unity with the world about us.

Ordway challenges the cynical view, "*Let nature take its course*," as an excuse for condoning land and water practices that too often debase individuals and communities. Instead, he asks us open-mindedly to examine a bold proposal, namely, that we start now to interest ourselves in what is happening to our natural surroundings, and how these happenings are affecting our mental, emotional and cultural stability. And he asks us to initiate mature thinking and action to correct the debilitating tendencies thus revealed. His own examination leads him to propose population controls, more wholehearted service to our communities, and curtailment of wasteful consumption. Above all, he urges the adoption of a positive conservation ethic.

If it is true, as studies of man's biologic make-up indicate, that mutuality and cooperativeness represent much stronger basic drives than do combativeness and competitiveness,[2] we have a powerful argument for the realism of Ordway's thesis. At a time when growing frustrations and tensions are accelerating mental illness, when disregard of our fellowmen is daily apparent in our littered landscapes, when logging, farming, and real estate developments are too often wrecking clean streams, and especially when population pressures threaten to devaluate the worth and dignity of the individual, *Prosperity Beyond Tomorrow* merits serious reading.

—BERNARD FRANK, *Washington, D. C.*

Joint Committee on Grassland Farming.—*Proceedings of November 30, 1955, Meeting, Cincinnati, Ohio. Zur W. Craine, Box 30, Norwich, New York.*

Twelve papers covering various phases of grassland agriculture, in mimeograph form, make up the 1955 proceedings of the Joint Committee on Grassland Farming. Each paper was presented by an authority in his particular field. Conservationists will find these proceedings extremely useful as a reference on grassland agriculture.

Potash in Agriculture. AMERICAN POTASH INSTITUTE, INC., *1102 16th Street, N.W., Washington, D. C., 30 pages. Illustrated. 1956.*

This is an excellent publication. It is well written and contains many excellent photographs—some in color. The charts and graphs are also well done. Some of the items

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[2] Dr. Ashley Montagu. *On Being Human.* Henry Schuman. New York. 1950 pp. 101-102.

[1] Reviewed by Ben Osborne in the January 1954 issue of this JOURNAL

covered include *Potash in Plant Food, Potash in Soils, Application of Potash, The Response of Crops to Potash* and others.

Wildlife of the Pacific Northwest. BY MARGARET MCKENNY, *Binsfords and Mort, Publishers, 124 N. W. Ninth Avenue, Portland, Oregon. 1954. $3.00.*

Here is another book written expressly for youthful conservationists as well as adults interested in wildlife. The subject is written in a clear interest-provoking style and covers the natural history of some of the more important mammals and birds of the Northwest.

The book also contains two additional sections: One on wildflowers and the other on mushrooms.

Native Grasses—*Legumes and Forbs.* PHILLIPS PETROLEUM COMPANY, *466 Adams Building, Bartlesville, Oklahoma. 30 pages, illustrated in color. 1955.*

This is the first section in a series of pamphlets covering pasture and range plants planned by the Phillips Petroleum Company. Included in this number are 21 excellent large color plates of the more imporant legumes and forbs found on the range. The characteristics of each plant have been carefully detailed—covering environment, economic value and its response to treatment and management.

Conservationists and others concerned with pastures will find this pamphlet extremely practical in further enhancing their knowledge of grasses, legumes and forbs. Institutional libraries will also welcome the pamphlet as a quick reference for those interested in this general subject.

Conservation Films

Regimented Raindrops II. *16 mm. Sound and color. 28 minutes running time. Produced by Meredith WOW, Inc., 17th and Farnam, Omaha, Nebraska.*

The premiere showing of *Regimented Raindrops II* on May 28 in Omaha marked the end of one year of filming by Radio WOW and WOW-TV to produce a 28-minute sound-color story of the soil water problem in the Mid-west.

Mindful that the Mid-west's agricultural-industrial economy depends heavily on a plentiful and easily accessible water supply, the Radio WOW and WOW-TV Farm Department set out to learn how the farmer was using and conserving water.

Shooting sequences from the air and on the ground, they told the story of the new emphasis being given to watersheds. They showed how farmers are using grassed water-ways, terracing, contouring, listing, good cropping and retarding structures to control watersheds that once served only to add to the threat of floods along the Missouri.

On-the-scene shots were taken of new and improved methods of irrigation. In most cases using water that was dammed up within a watershed, these farmers were shown irrigating their crops, using siphon tubes, lightweight aluminum pipes and sprinkler systems to insure that their crops got the needed amount of water.

Regimented Raindrops II has aimed at showing what teamwork among farmers can do towards regulating the supply of water. Its two predecessors, *Big Muddy* and *Regimented Raindrops I,* seen by thousands from coast to coast, dealt with other phases of soil and water conservation.

Regimented Raindrops II will be a public service feature of Radio WOW and WOW-TV. Anyone interested in showing the film to a group should write to Mal Hansen, farm service director, Meredith WOW, Inc., 17th and Farnam, Omaha, Nebraska.

—WILLIAM DUNN, *Omaha, Nebraska*

Elementary Conservation Series. *16mm. Sound and color. Produced by the Conservation Foundation. Available from Encyclopaedia Films, 1150 Wilmette Avenue, Wilmette, Illinois—at $50 each.*

The three films in this series are intended for use in the primary and middle grades science programs, specifically in correlation with units on conservation.

Your Friend the Forest—
Keep It or Destroy It *Six Minutes.*

The forest is shown as a source of lumber for people, a place for recreation, and a home for birds and animals. A brief review of proper management versus poor management, particularly the devastating losses caused by fire, provide an impressionable contrast.

Your Friend the Soil *Seven Minutes.*

This film does an effective job of associating soil and water conservation to an abundance of good food. The value of contour cultivation and the run-off-retarding value of plant growth are related to the production of garden crops, milk, bread and other products in the market place. In contrast, up-and-down-hill farming results in run-off water, gullies, poor pastures, poor cows, poor crops and an empty market place.

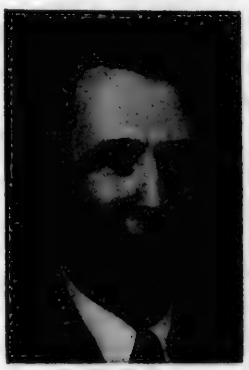
Your Friend the Water—
Clean or Dirty? *Six Minutes.*

The sources and value of pure water are shown in striking contrast to the causes and wastefulness of water pollution. Water is traced from its source—a forested watershed—to the reservoir, filtration plant and domestic use. Wildlife—beavers, moose, ducks and fish—is an interest-stimulating feature of the film. In contrast, water pollution makes water unfit for human consumption and for wildlife.

News Notes

PRESIDENT'S COLUMN

As members of the Soil Conservation Society of America it is sometimes well to ask ourselves why it is that we are so much interested in *"the science and art of good land use."* While each of us would not give the same reason if asked why we are members of the Society, I think that all of us who are concerned with land resources—soil, water, plants, and animals —have the feeling that we are dealing with fundamental stuff. We are concerned about resources because we realize that we are dependent upon them. They fulfill our creature and cultural needs—biological, social, recreational, and esthetic.



E. H. Graham

It is false, of course, to assume that all of our needs and desires are met by natural resources —the things in nature that we use. Procreation as a biological function, religion as a social practice, games as recreation, and great works of art as esthetic satisfactions meet human needs almost exclusively apart from the use of things in nature. Yet land resources are used to satisfy many of our basic needs, in today's complex and intricate civilization as in primitive societies.

From the biological standpoint, man's material needs are food, water, and shelter. To primitive man meeting these needs was a rather simple, direct activity. Today food is highly varied, with the American table holding fare from the far corners of the earth. Water in the modern world may be transported miles, treated, and used in ways undreamed of even by our parents. Homes are made of raw materials from many sources. Personal needs associated with birth, health, sickness, and death require use of many modified natural substances.

(Continued on page 202)

Open House At National Office

On June 14, open house was held in the new air-conditioned offices of the Society at 838 Fifth Avenue, Des Moines 14, Iowa. Seventy-five members and friends visited national headquarters on that day to consume milk and cheese furnished by the Iowa Dairy Promotion Association. Floral arrangements were presented by Wallace-Homestead Company, printers of the JOURNAL. Iowa Chapter members presented the national office with a guest book to record names of visitors. In conjunction with the open house Herb Plambeck, Farm Editor of Radio Station WHO and WHO-TV, presented a television program on June 13 and a 15-minute radio recording made at headquarters during open house.

Open house was held during Iowa's Soil Conservation Week sponsored by the State Soil Conservation Committee and other cooperating agencies and organizations.

Graham in Europe

President and Mrs. E. H. Graham sailed for Scotland on June 13, 1956, and plan to return to the United States on July 18. Graham is attending the General Assembly of the International Union for the Protection of Nature. He is Vice President of the Ecology Commission, one of 200 cooperating organizations or commissions of IUPA. John Berry of Scotland is President of the Ecology Commission.

Sponsor a Foreign Membership?

Chapters or members occasionally sponsor a member in another country. The parent Society has no budget for this purpose but plenty of opportunity to furnish the JOURNAL and other benefits of Society membership to our foreign friends.

Just recently a communique from Rev. J. P. Kelly of the Catholic Education Office, Archdiocese of Canberra and Goulburn, indicates they would like to receive the JOURNAL for the Library of St. Michael's Agricultural College, Inveralochy, Goulburn, New South Wales, Australia. They have difficulty in obtaining currency exchange. Similar requests are frequently received. Why not sponsor a membership today?

See page 200 for annual meeting program information and page 202 for reservations.

Chapter News

Rain or Shine! The Southern New England Chapter will hold a summer meeting at the Weston Nursery, Hopkinton, Massachusetts, August 8, 1956. Tour of Nursery, door prizes, talk by Father Joseph Linehan, S.J., just returned from Operation Deep Freeze in the Antartic, and finally a steak barbecue. . . . W. A. Mason, Jr., Newberry, South Carolina, was elected Chairman of South Carolina Chapter on June 13, 1956, at chapter meeting at University of South Carolina. John M. Dukes received award in membership contest. Frank F. Lesesne, Kingstree, received "Outstanding Conservation Achievement Award" for developing a technique of locating and designing dug ponds. J. E. Pollock, Augusta, Georgia, was speaker outlining value of grasses in rotation.

East Texas

East Texas members remember meetings at Hotel Fredonia, Nacogdoches on August 17 and September 21, the latter meeting "ladies night". . . . Northern Illinois Chapter met at Peoria in the State Water Survey Building on April 6. An inspection was made of the infiltration project to put water from the Illinois River into the ground through a pit in order to recharge the local groundwater formations. Dr. W. D. Maclay, Director, Northern Regional Research Laboratory, Agricultural Research Service, U.S.D.A., discussed the program of the laboratory in developing new uses of agricultural products. . . . Northern New England Chapter met at University of Maine, Orono, on June 22 and 23. The Penobscot County Soil Conservation District were hosts. Theme of the program was "Agronomy and Chemicals." Field tours were in charge of Roland Struchtemeyer, Head of Agronomy Department, and Oscar Wyman, Soule Glass and Paint Company. . . . Mississippi Chapter is dividing their chapter into subgroups to place individual members in closer contact with activity.

Michigan

Michigan Chapter held a program at St. Marys Lake on June 21 and 22 for outstanding F.F.A. Chapters recognized each year by the Michigan Chapter. Awards and program are jointly sponsored by chapter and the Kellogg Company. This year 21 chapters were recognized. These chapters had a total of 367 hours of classroom instruction and 78 field trips on soil and water conservation. They wrote 376 essays on conservation, held 38 debates and had a total of 34 guest speakers. Over 6,762 soil conservation practices were established on members farms. (Editor's Note: A project with local youth groups in your state could be an outstanding contribution to conservation by any chapter of S.C.S.A.) . . . On April 26 the "All Ohio" Chapter S.C.S.A. was chartered with

(Continued on page 201)

11th Annual Meeting

S · C · S · A

Soil Conservation Society of America

Mayo Hotel
Tulsa, Oklahoma

October 15, 16, 17, 1956

Oklahoma's Famous Grasses

PROGRAM

SUNDAY, OCTOBER 14, 1956

1:30 P.M.—REGISTRATION

7:30 P.M.—EVENING SESSION

Presiding, Herbert A. Hopper, National Council SCSA

Meeting of Chapter Delegates to Discuss Chapter Programs and Activities (Everyone Welcome)

MONDAY, OCTOBER 15, 1956

8:00 A.M.—REGISTRATION

10:00 A.M.—OPENING SESSION

Presiding, J. S. Russell, Vice President SCSA

Invocation

Welcome to Oklahoma—Nolen J. Fuqua, President National Association of Soil Conservation Districts, Duncan, Oklahoma

Announcements—Myron A. Hurd, Chairman of Local Arrangements Committee for Convention, Claremore, Oklahoma

President's Message—Edward H. Graham, President SCSA

Keynote Address—Herschel Newsom, Master National Grange, Washington, D. C.

1:30 P.M.—AFTERNOON SESSION

Busses leave Mayo Hotel for tour Double Creek Pilot Watershed

2:30 P.M.—*Presiding*, (At Watershed Site) Harry M. Chambers, National Council SCSA

5:00 P.M.—Busses start return trip

6:00 P.M.—*Barbecue*, Tulsa State Fair Grounds, Courtesy Oklahoma Members, Business and Industry.

7:30 P.M.—*The Story of Sandstone Creek*—L. L. (Red) Males, President, Washita Watershed Association, Cheyenne, Oklahoma

Land Appreciation Schools—Edd Roberts, Extension Soil Conservationist, Stillwater, Oklahoma

TUESDAY, OCTOBER 16, 1956

9:00 A.M.—MORNING SESSION

Presiding, Chester S. Wilson, National Council SCSA

Theme: Elements of a National Resources Policy

(a) *Factors Influencing the Establishment of a National Land Policy*—Horace J. Harper, Director, Samuel Roberts Noble Foundation, Ardmore, Oklahoma

(b) *Factors Influencing the Establishment of a National Water Policy*—Harold E. Thomas, U. S. Geological Survey, Salt Lake City, Utah

10:15 A.M.—*Water Resources Development in Ontario*—Edward G. Pleva, Head, Department of Geography, University of Western Ontario, London, Ontario, Canada

10:45 A.M.—*Theme: Correlation of Watershed Improvement and Major River Basin Development*

(a) *Effects of Watershed Improvement on Major River Basin Development*—Thomas Maddock, Jr., Bureau of Reclamation, Department of the Interior, Washington, D. C.

(b) *Effects of Major River Basin Development on Watershed Improvement*—Albert S. Fry, Tennessee Valley Authority, Knoxville, Tennessee

1:30 P.M.—AFTERNOON SESSION

Presiding, Frank C. Edminster, National Council SCSA

Theme: Competition For Land

(a) *Impact of Urban and Other Development on Agricultural Land*—Fred W. Herbert, Soil Conservation Service, USDA, Berkeley, California

(b) *Problems, Examples and Possible Solutions*—Francis C. Lindsay, Member of Assembly, California Legislature, Sacramento, California

3:00 P.M.—*Women and Children Can Promote Conservation*—Mary Kennington, Bureau of Indian Affairs, Department of the Interior, Washington, D. C.

Theme: The Dust Bowl

(a) *Cause and Effects*—W. S. Chepil, Agricultural Research Service, USDA, Manhattan, Kansas

(b) *Landowner's Problems and Responsibilities*—A. P. Atkins, Rancher, Guymon, Oklahoma

(c) *Future Public Policy*—Paul W. Griffith, Extension Service, Kansas State College, Manhattan, Kansas

6:30 P.M.—EVENING SESSION

Banquet

Presiding, Firman E. Bear, National Council SCSA

Presentation of SCSA Awards—R. H. Musser, Chairman Fellows and Honorary Member Committee, SCSA, Arlington, Virginia

Address—Honorable Clifford Hope, Member of Congress from Kansas

Introduction of New Officers

Entertainment

WEDNESDAY, OCTOBER 17, 1956

8:30 A.M.—MORNING SESSION

Presiding, Russell G. Hill, Vice President SCSA

Progress of Technical Committees—Wallace A. Mitcheltree, Rutgers University, New Brunswick, New Jersey, chairman

(a) *Technical Standards Committee*—Alfred M. Hedge, Soil Conservation Service, USDA, Washington, D. C.

(b) *Watershed Management Committee*—Carl B. Brown, Soil Conservation Service, USDA, Washington, D. C.

(c) *Drainage*—Paul Zwerman, Cornell University, Ithaca, New York

(d) *Soil Structure*—T. M. McCalla, University of Nebraska, Lincoln, Nebraska

(Continued on page 204)

Chapter News

(*Continued from page 199*)

110 members present at a luncheon in Columbus. E. H. Graham, President, presented the charter. . . . New Jersey Chapter publishes a newsletter to keep members up-to-date on Society activity. The chapter plans three meetings during the year, two in conjunction with local soil conservation districts and the annual meeting which will be held on January 23, 1957, at Trenton, in conjunction with New Jersey Farmers Week. . . . North Alabama Chapter published a newsletter on April 30 with clever headings and covering many points of interest. Annual Chapter meeting is scheduled for July 28. . . . Fred W. Herbert, program chairman of the San Francisco Bay Chapter, writes they held their fourth and fifth meetings on the general subject, "Problems Caused by Converting Agricultural Land to Urban Uses." On March 19, Karl J. Belser, Director of Planning, County of Santa Clara, discussed "Zoning Agricultural Land." On April 16, William E. Spangle, Jr., discussed "The Relation of Urban Development to Agricultural Land Use." Mr. Spangle is Planning Consultant, San Mateo County Planning Commission. At the April meeting Ze'ev Vered, a post-graduate student at the University of California, told chapter members about the ways Israel is solving the problem of land use.

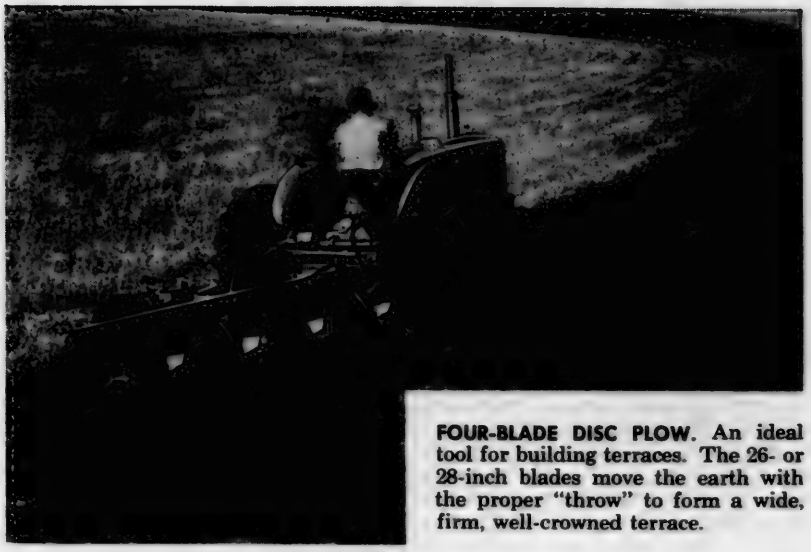
On January 27 the South Central Oklahoma Chapter held a winter meeting at Holdenville. Chairman W. B. Jessee was in charge of the meeting. Secretary Pritchard reported on the national organization and plans for the Tulsa meeting. Wesley Mienders told of his work regarding water laws. He spent considerable time at the University of California with C. E. Busby and they developed a summary of recent legislation by various states. Hugh M. Sandlin, House of Representatives of Oklahoma Legislature, told of Oklahoma's Water Problems and Needed Laws. Elected chairman of the chapter for 1956 was Horace J. Harper, Ardmore and Wesley Meinders, Secretary.

Missouri

The "Show-Me" Chapter of Missouri held their charter night meeting on January 31 with an attendance of 150 at the Statler Hotel in St. Louis. President Graham told of the work of the Society as did Austin L. Patrick, immediate past president. Secretary Pritchard presented the group with their charter and Donald A. Williams, council member, gave the address of the evening.

Your Society . . .

Did you know that Ralph H. Musser, Field Representative for the Soil Conservation Service, was the first president of SCSA? He and Mrs. Musser reside at 6304 Haviland Drive, Bethesda 14, Maryland. Mrs. Musser has attended every annual meeting to date.



FOUR-BLADE DISC PLOW. An ideal tool for building terraces. The 26- or 28-inch blades move the earth with the proper "throw" to form a wide, firm, well-crowned terrace.

New! IMPLEMENTS with Real BITE for Soil Conservation

Here's a line of real earth movers for the Allis-Chalmers WD-45 Tractor — implements that make farm tractor power more effective than ever before for conservation work.

Allis-Chalmers *Engineering in Action* now makes it possible for a farmer to perform efficiently — with his own tractor — the operations usually necessary in conservation farming. This equipment is ideally designed for building and maintaining terraces, grassed waterways, drainage outlets, strips, contours — even farm pond work.

TRACTION BOOSTER system gives the Allis-Chalmers WD-45 Tractor real ground-gripping pull . . . to get earth-moving jobs done quicker and easier, even in tough, dry soils. SNAP-COUPLER hitch saves time . . . provides added convenience.

See your Allis-Chalmers dealer, or write for literature.

TWO-WAY SCOOP. This new heavy-duty tool builds ponds, fills gullies and ditches, maintains terraces. Holds 13½ cubic feet. Reversed, it becomes a materials carrier.

BLADE. Six-foot reversible scraper has real penetration for such jobs as repairing terraces, making and cleaning ditches, leveling and backfilling.

TRACTION BOOSTER and SNAP-COUPLER are Allis-Chalmers trademarks.

ALLIS-CHALMERS, FARM EQUIPMENT DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS AC

President's Column

(*Continued from page 199*)

Today we meet biological needs by first earning money that can then be used to obtain the fundamental requisites of living. We exchange services for the things that fulfill our basic requirements. Since it takes money to obtain food, water, clothing, housing, medical care and other necessities of life, the making of money often hides from us the importance and the source of the things we need most. No one can deny the immediacy and the urgency of economic processes; without a medium of exchange obtained by services rendered, there would be chaos. Yet real wealth is not so much in the coin of the realm as in the natural resources it can control to meet our needs. Whether raw materials are in their natural form or transformed and developed by human ingenuity, it is the use we make of our available resources that shapes our world and enables us to meet basic human demands.

But man is more than an individual creature. Socially gregarious, he lives in organized groups. The primitive family associated itself with other families in tribes. Today, even in the midst of great metropolitan centers, we live in recognizable neighborhoods and communities. In each of these associations there are needs peculiar to the group. Communities need centers of business, churches, schools, and other institutions to fulfill social needs. More formal associations are expressed in city, state, and national governments, each with its particular function and its special demands upon people and resources. As our world becomes more complex, the needs of social groups and institutions become more significant. They call for more products of the land, for space, for clean water and pure air, and make other demands upon resources generally as well as upon the inventiveness and social adjustments of the people themselves.

One of the great dividends of modern living is leisure. Today the average U. S. working man has more than twice the spare time his father had before him. Our recreational needs are receiving ever increased attention. The demand for community swimming pools is an example of an attempt to meet this need—to the despair of community planners and neighboring residents alike. Recreational outlets are various, but some are related especially to the out-of-doors, such as hunting, fishing, golf, and camping. Radio, television, and the theatre do not demand resources in natural condition, but they do utilize raw materials in specially developed form. As our population and our leisure increase so will the demands for playgrounds, parks, bathing beaches, and wilderness areas where people can find the kind of relaxation each values most. Land and water areas are essential to meet this need.

Recreation makes us conscious of the

REMEMBER TO GET A NEW MEMBER

fact that resources have value beyond their capacity to produce commodities. While such values are intangible in the cold economic terms of cost-benefit ratios, they are nevertheless genuine and well worth recognition. Perhaps the most delicate and sensitive value that can be ascribed to land is its potentiality for fulfilling an appreciation of the esthetic. Our emotional, imaginative, and intellectual yearnings are often satisfied by art, music, and literature, but there is similar satisfaction for most of us in a ride through the country, a walk along the shore, or the view from a mountain top.

It is because the land and its products mean so much in fulfilling our many needs —biological, social, recreational, and esthetic—that we find ourselves so much interested in the Soil Conservation Society of America. For the Society is concerned with land in its broadest sense—with the fact that the environment in which we live and the natural resources the environment provides are what make living both comfortable and rewarding. And the Society is proof that we have it in our power to prevent the destruction of that environment, to utilize it to the betterment of ourselves and others, and to get from it the many satisfactions, material and inspirational, that go to make a good and fruitful life. In these fundamental satisfactions we have ample justification for our dedication to a movement that concerns itself with the nature, use, and development of our land and land resources.—*Edward H. Graham.*

PLEASE NOTE NEW ADDRESS
(May 15, 1956)
SOIL CONSERVATION SOCIETY OF AMERICA
838 Fifth Avenue
Des Moines 14, Iowa

APPLICATION FOR HOUSING ACCOMMODATIONS, NATIONAL CONVENTION S.C.S.A., TULSA, OKLAHOMA OCTOBER 15-17, 1956

For your convenience in making hotel reservations for the Soil Conservation Society of America Convention to be held in TULSA on October 15, 16, 17, the necessary information and forms are supplied below.

The MAYO HOTEL has been designated as convention headquarters. However, it is likely that it will be necessary to use the facilities of other hotels. The housing chairman will make all reservations.

HOTELS	Single	Double	Twin	Suite	Distance from Headquarters Hotel
Mayo Hotel	$7.00-12.00	$9.00-14.00	$10.00-15.00	$25.-75	
Adams Hotel	4.00- 6.00	6.00- 8.00	6.50- 8.50		½ block
Alvin Plaza Hotel	4.00- 7.00	5.50- 8.00	6.50- 9.00		3½ blocks
Bliss Hotel	4.00- 6.50	5.50- 7.50	6.00- 8.00		6½ blocks
Hotel Tulsa	5.00-10.00	7.00-12.00	8.50-12.50	12.-35	5 blocks
Trimble Hotel	3.00- 3.50	4.50- 5.00	6.00		3½ blocks
Wells Hotel	4.00	5.00	6.00		4 blocks
Western Village	7.00	8.00-50.00	10.00	15.-50	7 miles
TOURIST COURTS	**Single**	**Double**	**Three**	**Four**	
Cooks Court	$2.50- 4.50	$2.50- 4.50	$ 3.50- 5.50	$ 4.50- 6.50	5 miles
Downtown Motel	5.50	6.50	9.18	10.20	2½ miles
Grotto Courts	4.08	4.50- 5.10	5.50	8.00	5½ miles
Hi-Lo Motel	5.10	5.10	6.12	8.16	6 miles
Rio Courts	3.50	3.50	5.00	6.00	2½ miles
Sheridan Hills Motel	5.50	7.00- 8.00	9.00	10.00-14.00	5½ miles
Tulsa Auto Courts	5.00	5.00	7.00	8.00	6½ miles
Tulsa Ranch-O-Tel	5.61	7.00- 8.00	9.00	10.00	6½ miles
Whitt Motel Court	5.00- 6.00	5.00- 6.00	7.00- 8.00	8.00-10.00	4½ miles
Will Rogers Motor Court	5.50	6.00	8.00	8.50	5 miles
Winston's Motor Court	6.00	7.00- 8.00	8.00- 9.00	10.00	6 miles

DETACH AND MAIL DIRECT TO:

Mr. Paul V. Hartman, Chairman, Housing Committee
Soil Conservation Society of America
616 South Boston, Tulsa, Oklahoma

First Choice (Place)_____ Second Choice_____

Single_____ Double_____ Twin beds_____ Suite_____

Date of Arrival_____ Date of Departure_____

Name of Guests: 1._____ 2._____

3._____ 4._____

Individual Requesting Reservations:_____

NAME:_____

ADDRESS:_____

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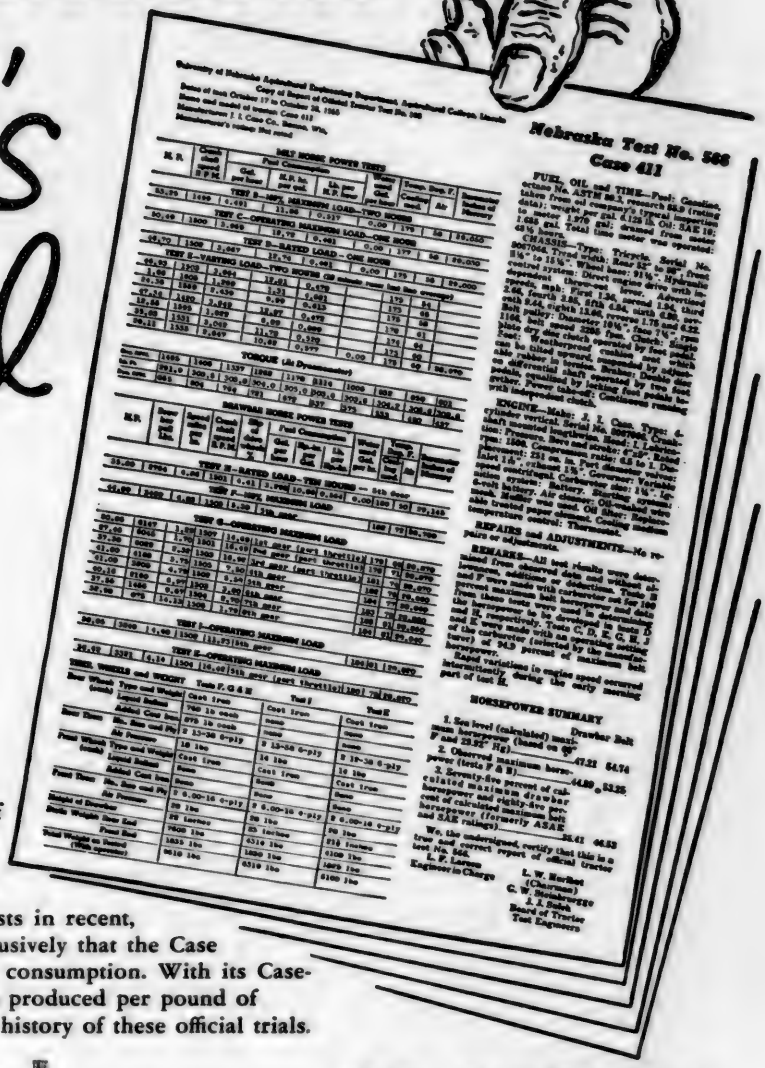
World's Record for Fuel Economy



Case engineers . . . dedicated to the objective of giving farmers a 4-plow tractor without equal in performance, power and economy . . . have climaxed their efforts in the new 8-speed Case "400." Evidence of this achievement rests in recent, impartial Nebraska tests. Results show conclusively that the Case "400" is the all-time champion for low fuel consumption. With its Case-designed Powrdyne engine, more power was produced per pound of gasoline than any other tractor in the whole history of these official trials.

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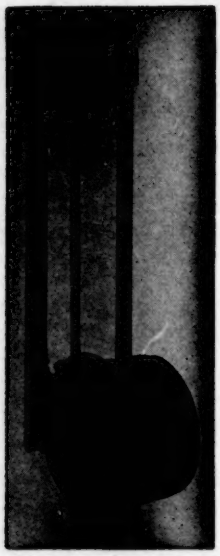

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(*Continued from page 200*)

10:15 A.M.—Panel: *Accelerating Progress in Applying Conservation Measures*—Clair P. Guess, Jr., National Association of Soil Conservation Districts, League City, Texas, leader; Harral Allen, President, Oklahoma Association of Soil Conservation Districts; C. W. Lester, Farmer and District Supervisor, Cheyenne, Oklahoma; Bob Wright, Soil Conservation Service, Cheyenne, Oklahoma; John Teackell County Agent, Cheyenne, Oklahoma; J. C. Rogers, Vocational Agriculture Instructor, Cheyenne, Oklahoma; Johnny D. Simpkins, Farmers Home Administration, Cheyenne, Oklahoma; Orville A. Tate, Agricultural Stabilization and Conservation, Cheyenne, Oklahoma; Allen C. Elliott, Indian Service, Clinton, Oklahoma

12:00 Noon—BUSINESS LUNCHEON SESSION
Presiding, J. Selby Young, National Council SCSA

2:00 P.M.—AFTERNOON SESSION
Presiding, Elmer L. Sauer, National Council SCSA
Symposium—Land Utilization in the United States (Report of Technical Committee on subject)—J. C. F. Tedrow, Rutgers University, New Brunswick, New Jersey, chairman

(a) *Land Inventory and Population Growth*—H. H. Wooten, Production Economics Research Branch, USDA, Washington, D. C.
(b) *Changes in Land Use*—Frank W. Suggitt, Michigan State University, East Lansing, Michigan
(c) *Agricultural Land Use from Private and Public Viewpoints*—J. F. Timmons, Iowa State College, Ames, Iowa
(d) *Wildlife Areas*—Albert W. Bromley, New York Conservation Department, Albany, New York
(e) *Land Problems in Relation to Rural and Urban Planning*—E. B. Wilkens, Rutgers University, New Brunswick, New Jersey
(f) *Exploitatioin and Conservation of Land*—Paul B. Sears, Yale University, New Haven, Connecticut

4:15 P.M.—*Closing Remarks by President*

REPRINTS AVAILABLE TO SOCIETY MEMBERS

On page 181 of this issue you will find the last in a series of six articles published in the Journal of Soil and Water Conservation on the general subject "Protecting and Developing the Nation's Watersheds." The articles were prepared by the Watershed Management Committee of the SCSA and appeared in the Journal as follows:

March 1955—"The Nation's Water Requirements"
May 1955 —"The Nation's Available Water Resources"
July 1955 —"The Nation's Water Resource Problems"
Sept. 1955 —"Measures Needed to Manage Watersheds"
May 1956 —"Watershed Resource Management"
July 1956 —Planning and Developing "Our" Watershed Resources

Reprints of the articles are available in the form of a 24-page booklet with a two-color cover designed by Felix Summers, Wisconsin member-artist. The booklet will be available about September 15, 1956. Members of the Society are entitled to one complimentary copy and may receive it by sending a postcard to Society's national office, 838 Fifth Avenue, Des Moines 14, Iowa, asking for "Watershed" booklet. Additional single copies may be purchased at 50c each. Prices for bulk copies furnished on request.

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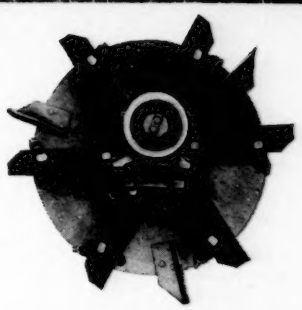

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